

# BEVERAGE & FOOD WORLD



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MARCH 1996

Vol. 23 • No. 2

Price: Rs. 30

AHARA '96 SPECIAL ISSUE

## The Only Name to Remember for Ultrafine Filtration of Liquids and Gases

### Product Range

Liquid Filters upto 0.1 micron.

Widely used for chemicals, pharmaceutical, process water, edible oils, serum, electronic fluids etc.

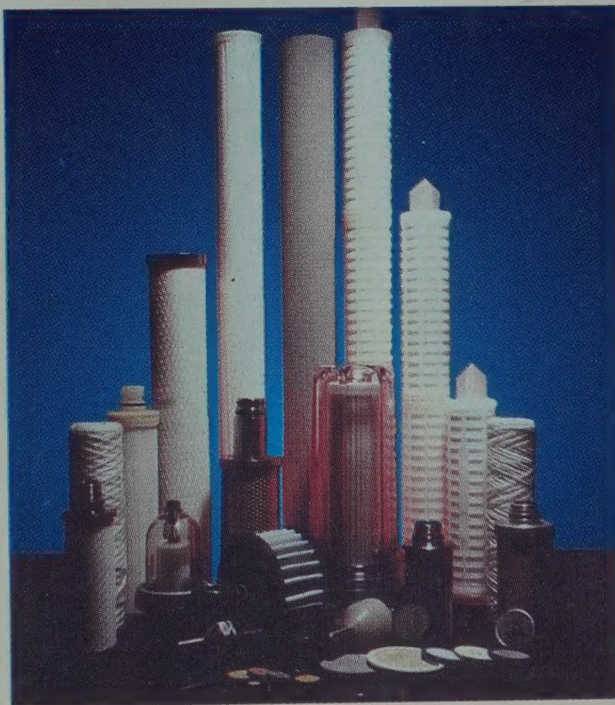
Air Filters upto 0.01 micron.

For instrumentation, electronics, pneumatic systems, pharmaceutical, etc.

In-Line Conical Filters (ILCF). \*

For continuous filtration upto 800 LPH with interchangeable porosities from 100 upto 0.2 microns. Suitable for product filling and bottling lines, laboratories, research centres etc.

\* Design registered and patented.



## Kumar Ultrafine Filters

### Stainless Steel Lab Filters.\*

With interchangeable porous media from 100 upto 0.2 microns. Most ideal for laboratories, research centres and all chemists with research mind.

### Materials of Construction

Filter Cartridges and Discs are made of chemically compatible materials like Polypropylene, Nylon, PVC, PVDF, PTFE, Glassfibre, Sintered Bronze, Sintered SS, Impregnated paper etc.

Filter Housings are fabricated out of Stainless Steel, Carbon Steel etc. Linings of Rubber, FRP, PVDF, etc. are also undertaken. Coded construction under Third Party Inspection are possible.



### KUMAR PROCESS CONSULTANTS & CHEMICALS PVT. LTD.

Sales & Head Office: 230/4, Ashoka House, Behind Puranmal Delhiwala, Linking Road, Bandra (W), Bombay 400 050.

Tel.: 645 1964, 643 2512, 642 0637. Fax.: (022) 643 2512, 642 0637 Tlx.: (011) 75973 KPCC IN

**Hyderabad: SANKALP CORPORATION**

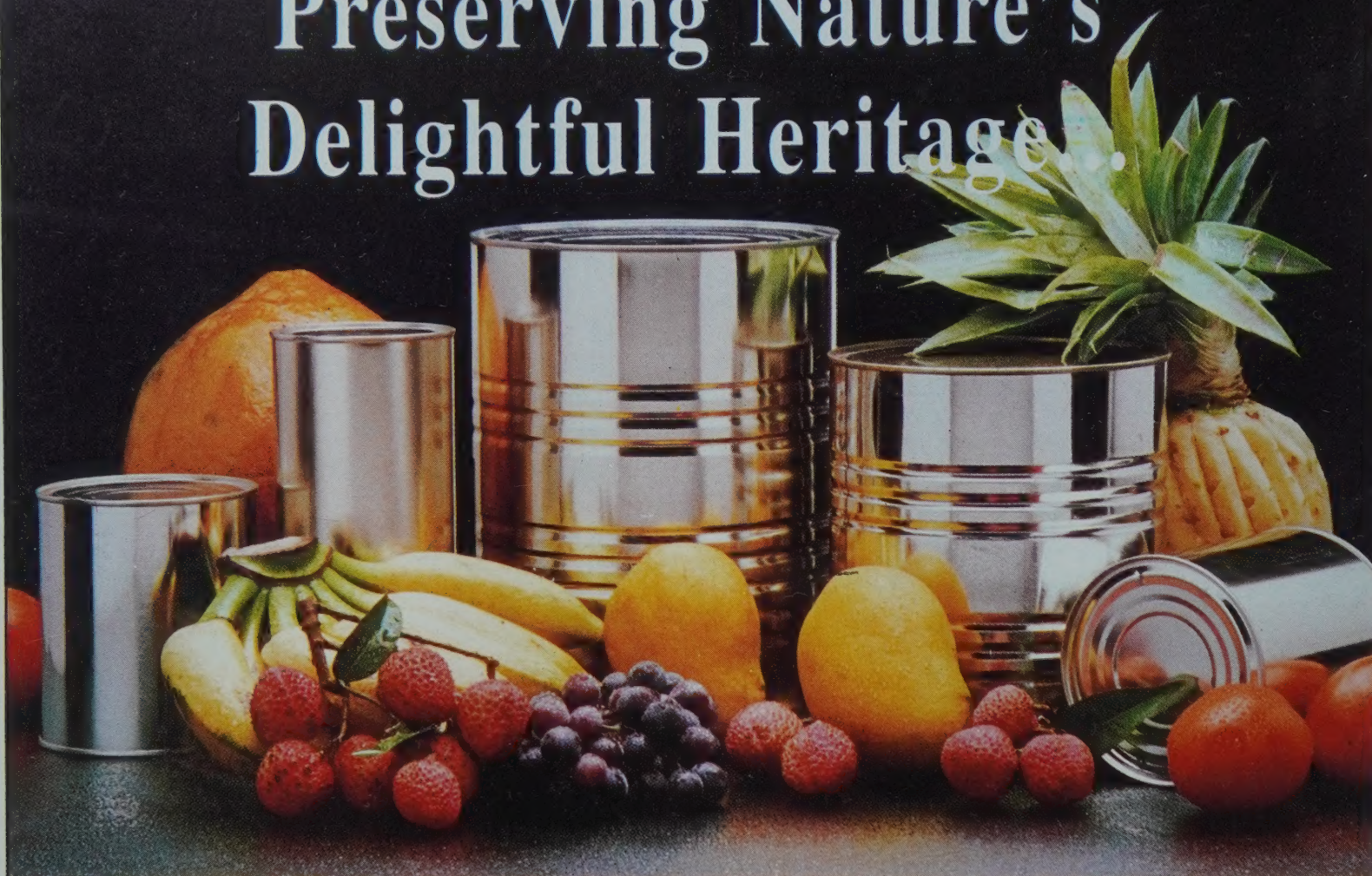
Vishwa Bhavan, 3-6-563 Himayat Nagar, Hyderabad 500 029 Tel.: (040) 633 006, 630 607

**Madras: SURAJ ENTERPRISES**

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*The way we can, no one else can*



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Offers basic Biscuit & Bread Baking Ovens to International standards to produce both soft and hard dough variety Biscuits to any capacity starting from 2 to 10 tonnes per shift.



Automatic Bread/Bun Baking Travelling Oven



Automatic Bread/Bun Baking Travelling Oven



Automatic Tin/Metal Printing Travelling Oven



Automatic Biscuit/Bread Baking Travelling Oven

## ADMIR ENTERPRISES

("Admir Enterprises") Industrial Ovens Gas & Oil Fired for Biscuits, Bread Baking, Tin, Metal Printing & Barrel Drying Ovens.

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The Ovens are more efficient in terms of Baking Performance & Fuel Consumption.

The Temperature Profile for each variety of Biscuits is Automatically maintained as per the requirement.

These Ovens are running all over India & Abroad.

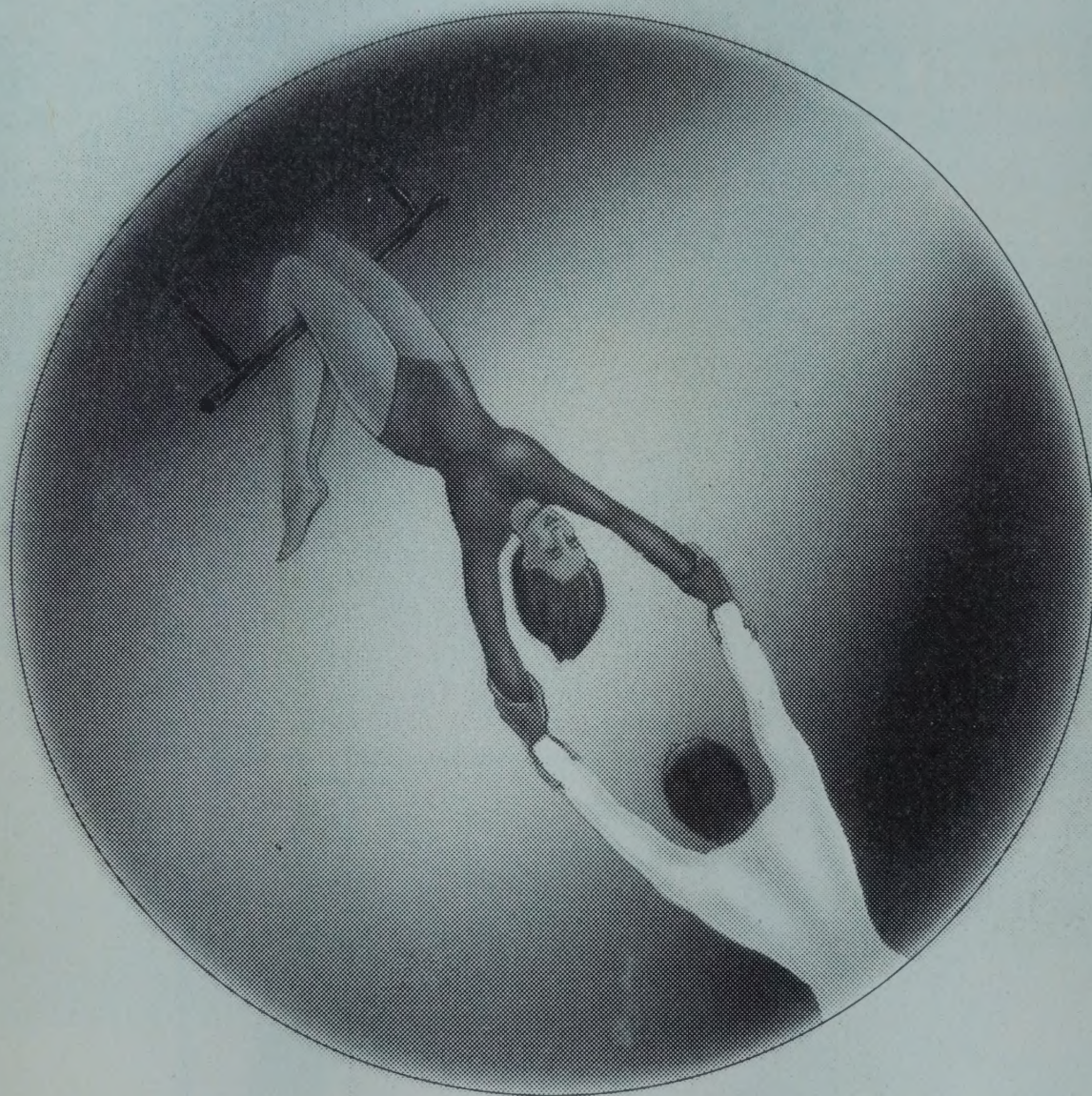
For Further details please contact:

**Admir Enterprises**



Plot No. 1/E-4, Shivaji Nagar, Govandi, Bombay 400 043. India  
Tel: (Office cum Resi.) 5568446/ 5511718/5518182 Fax: 91-022-5568446.





**Now  
Make  
Your  
Custody  
Transfers  
With  
Absolute  
Confidence**

## The Micro Motion Mass Flowmeter from Fisher-Rosemount

Moving liquid, gas or slurries from one terminal to another can give you many anxious moments.

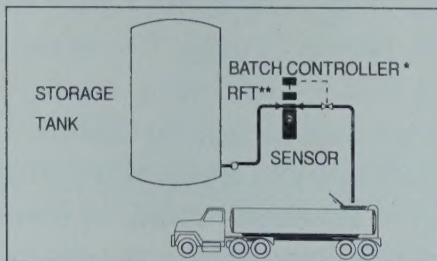
Because when temperature and pressure affect your consignment, your profits hang in the balance.

Which is why you'll appreciate the reliability of Fisher-Rosemount's Micro Motion Mass Flowmeter.

### APPLAUDED BY ALL

The Micro Motion Mass Flowmeter is particularly recommended for Custody Transfer applications, as in the case of Cochin Refinery (CRL) and Hindustan Organic Chemicals Ltd. (HOCL). A set of Mass Flowmeters are used to transfer LPG

from the Marketing Terminals at CRL into the receiving terminal at HOCL and return the processed LPG back to the refinery. The flow output signals from the meters at both terminals verify the transfer quantities and form the basis of billings. With the accuracy achieved due to measurement by mass, previous discrepancies as with PD meters have altogether disappeared.



### ON FIRM GROUND

Hardly surprising, therefore, that with its accuracy, adaptability and range, the Micro Motion Mass Flowmeter has an installed base of more than 1500 units in India, and 1,50,000 worldwide. Across a wide range of applications in fuel oil transfers, particularly in furnace oil, LSHS and LDO. And in custody transfers for petroleum products like LPG, Naphta and chemicals like Phenol and Aniline.

Invest in the Micro Motion Mass Flowmeter from Fisher-Rosemount. And custody transfers won't seem such a slippery business anymore.



### Fisher-Rosemount (India) Limited.

Taj Building, 3rd Floor, 210, Dr. D. N. Road, Fort, Bombay - 400 001.

Tel.: (022) 287 4758/59

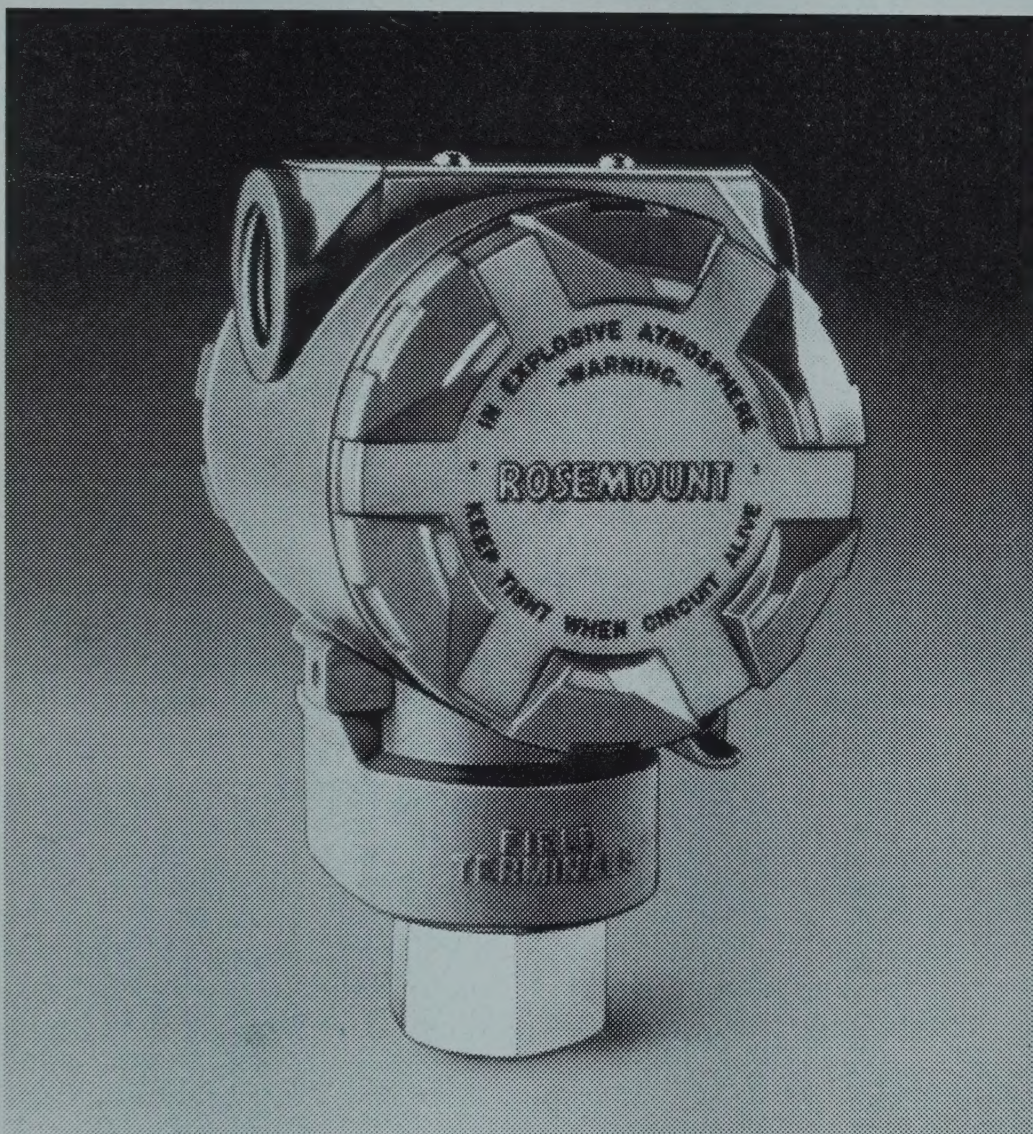
Tlx: 011-83757 JSGR IN. Fax: (022) 287 0502

**FISHER-ROSEMOUNT™**

Managing The Process Better™



# THIS IS NOT JUST AN EXAMPLE OF ENGINEERING IT'S ALSO A DEMONSTRATION IN ECONOMICS.



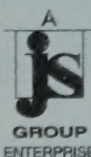
Study the Model 2088 pressure transmitter, appreciate its combination of fine engineering, reliability in operation and excellent value for money. And you'll see why it's set to become the preferred choice of both OEM's and users. With its compactness in size and weight the Model 2088 occupies less space, offering greater design flexibility.

Besides it offers two design variations : The Model 2090 F for the food and beverage industry and the Model 2090 P for the pulp and paper business. The Model 2090 F has a Tri-clamp® process connection that provides stability and reliability in challenging sanitary applications. While the Model 2090 P ensures that process clogging is overcome by incorporating a connection that positions the isolating diaphragm of the transmitter, flush with the vessel wall, thereby eliminating impulse piping.

On further examination, you'll find even more value in the Model 2088. Like a unique thin film polysilicon sensor and electronic technology, with micro process-based circuitry for maximum performance. A modular design for easy maintenance and a method of calibration that eliminates all potentiometers and active circuit components, to significantly improve transmitter stability.

All of which you agree, combine to put the Model 2088 in a class of its own.

**FISHER-ROSEMOUNT™**  
Managing The Process Better™



**Fisher-Rosemount (India) Limited**  
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MFG. OF CONVEYOR COMPONENTS



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MANUFACTURERS OF SLAT CONVEYOR CHAIN & WHEEL

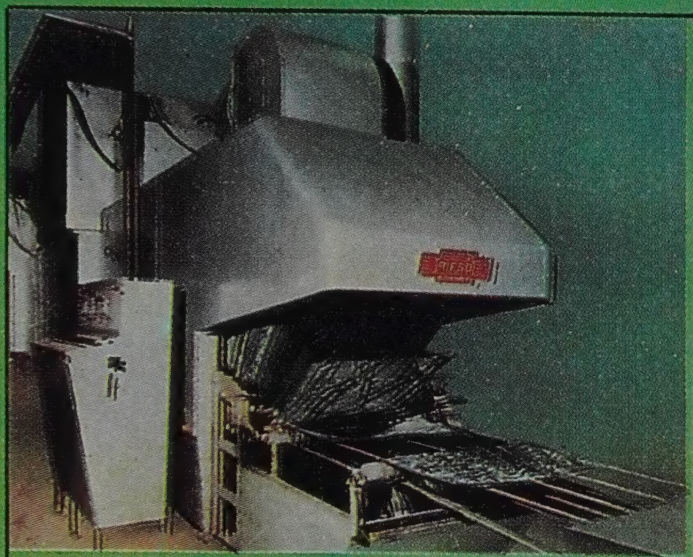


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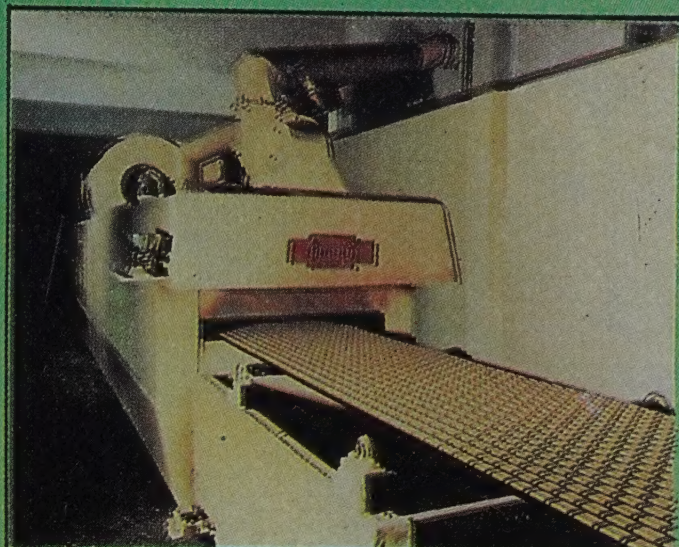


# AIFSO

## A name synonymous with Quality



TIN/METAL DECORATING OVEN

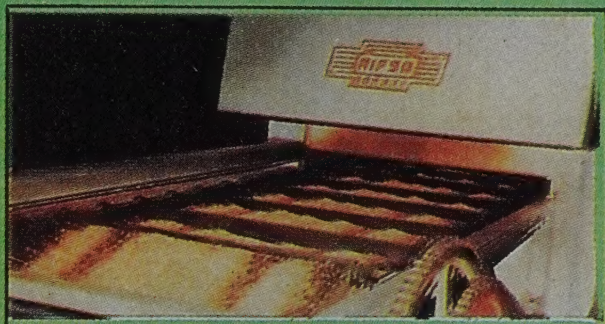


BISCUIT/BREAD BAKING OVEN

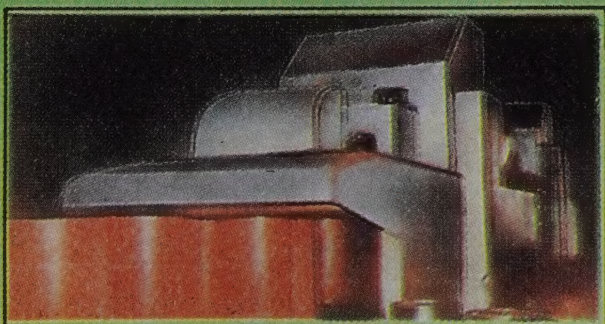
### Manufacturers, Exporters of:

Direct and Indirect  
Gas and Oil Fired  
Automatic  
Converised Ovens  
for:

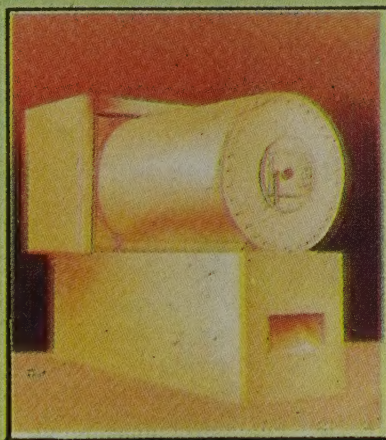
- Biscuit/Bread Baking
- Tin/Metal Decorating
- Barrel Drying
- PVC-lined Components
- Lug Caps/  
Crown Caps Drying



SUPARI DRYING OVEN



BARREL DRYING OVEN



LUG CAPS & CROWN CAPS  
DRYING

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- Bakeman's ● Nutrine
- Balmer Lawrie
- Bharat Metal Box
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- Shetron
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- Koshi Metal - Nepal
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**AIFSO**  
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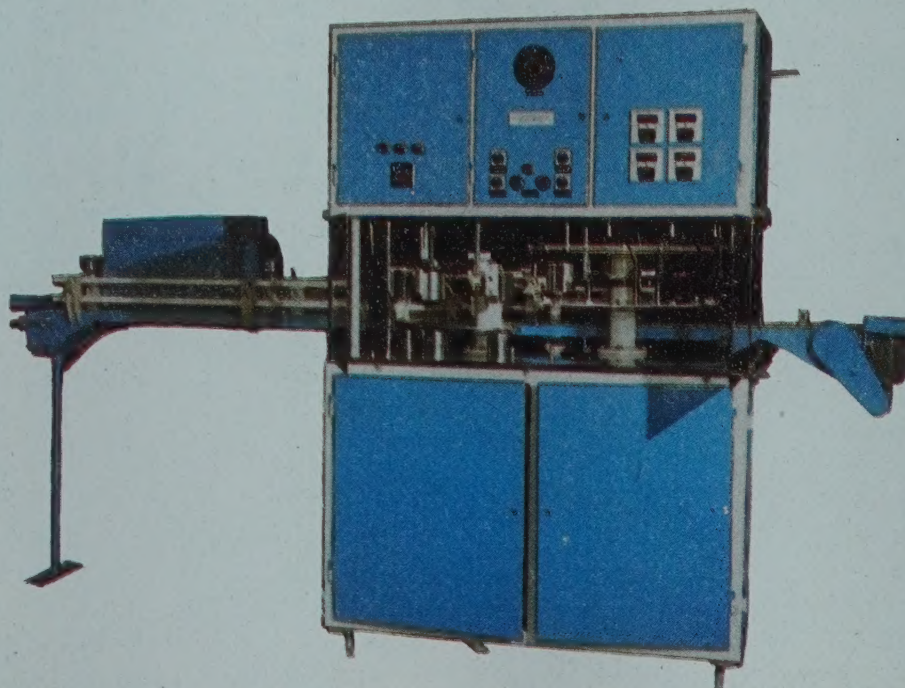
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A-1, Veena Beena Apts.,  
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## MINERAL WATER FILLING MACHINE

Fully automatic PVC/PET bottle  
Rinsing, Filling, Capping m/c-  
30/60/120 Bottles per min-capacity  
1000 c.c., u.v. lamps provided for  
sterilizing cap inside and filling  
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Filling area totally isolated as 'no man's land' - 10' x 10' room enough.

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**WINNER OF "PACMACHINE" 1994 AWARD BY INDIAN INSTITUTE OF PACKAGING**

## CAN SEAMING AND REFORMING MACHINES FOR FRUIT AND VEGETABLE CANNING INDUSTRY

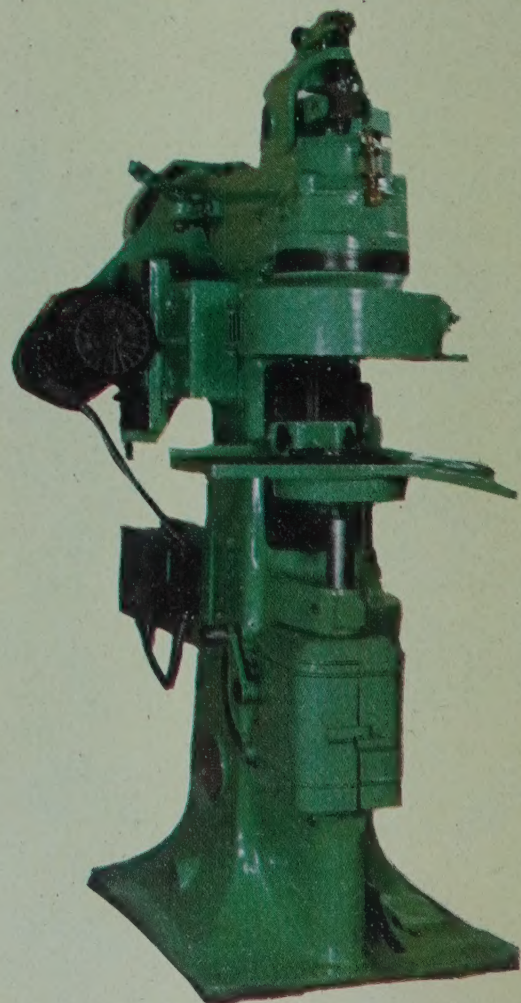
Can Seaming, Reforming, Flanging, Embossing and  
Testing Equipment of International standard.  
Capacity from 10-30 cans/minute, for Canning factory.

These include high speed can stationery 24 DS type  
Semi-automatic Seamer having speed of 25/30 cans from  
202 to 700 dia. cans of proven design.

*Contact for Metal Box Machines Spares*

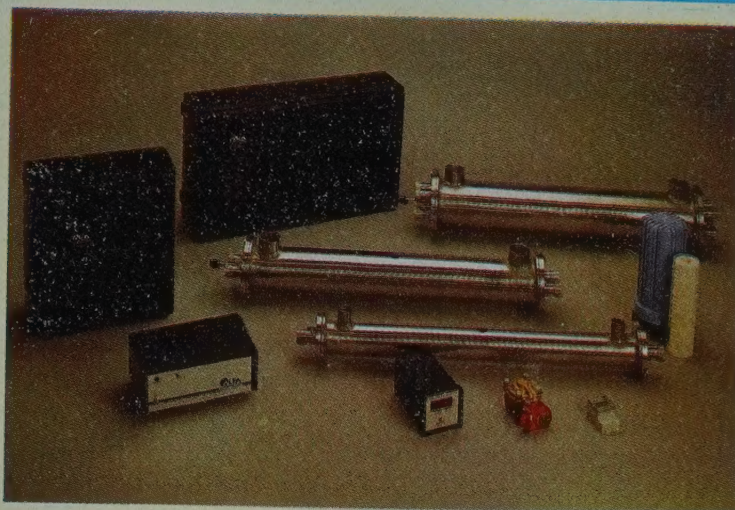
## CANTECH MACHINES

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# Water Purification Professionals for Food, Beverage & Pharma Applications.



*9 years' experience with over 50,000 satisfied users throughout India.*



*Models ranging from 100 LPH to 1,00,000 LPH.*



*Models with high efficiency and reliability for high  
purity water conforming to WHO/IP/BP norms.*



*Models in SS 304/316 for durability and long life.*



*Users friendly models with easy installation and low maintenance.*



**AUTOMATIC ON-LINE VALIDATION FOR FAIL  
SAFE OPERATION OF SYSTEMS.**



*Users include — Pepsi, Parle Biscuits, Kwality Biscuits, Baskin Robbins,  
Temptation Foods, Pfizer, Taj Group of Hotels, Oberoi Hotels etc.*



***Count on it — 100%***

Manufactured by: **AWP PVT. LTD.**

222, Shah & Nahar, A2, Lower Parel, Bombay-400 013  
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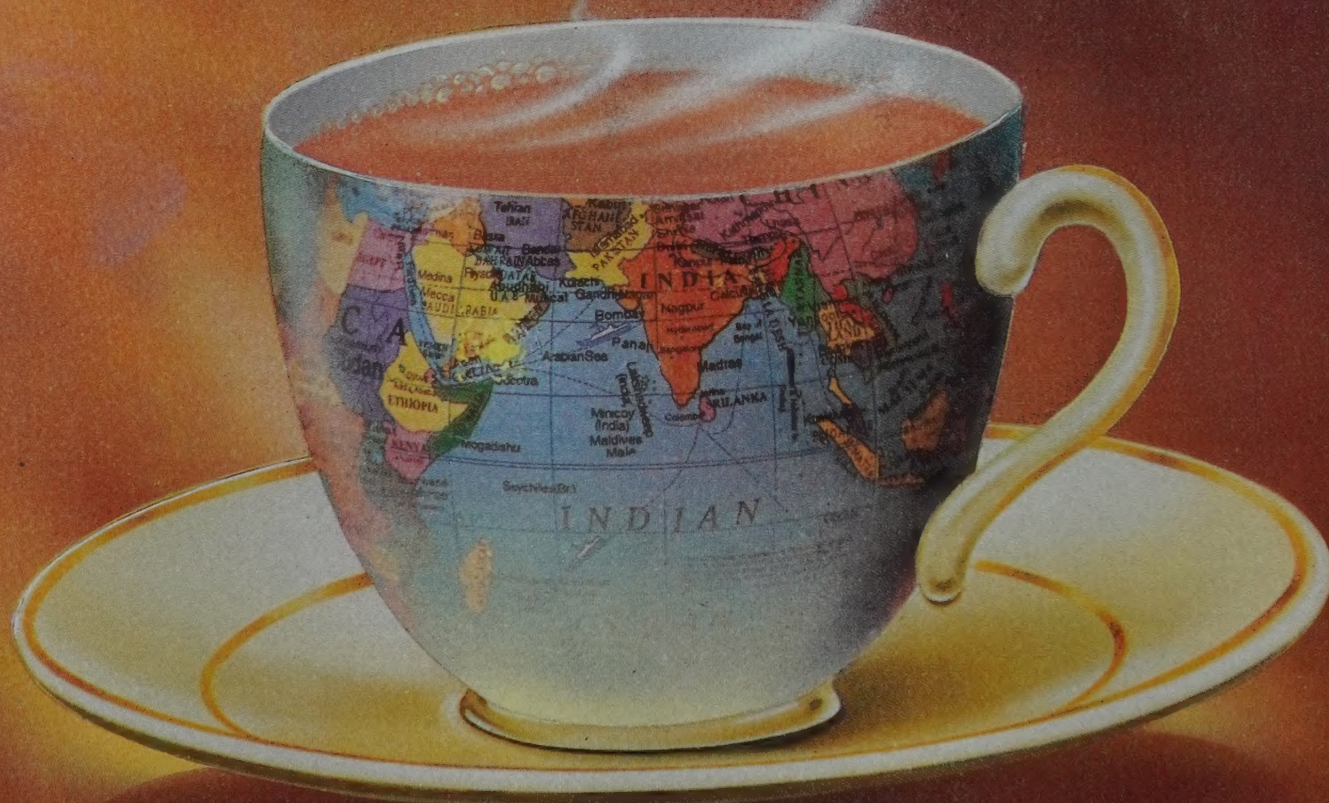
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*Can You Smell Profits ?*



Sapat has been greeting millions of Indians every morning through their wide range of quality teas since 1905. Today, an estimated eight million people the world over are savouring Sapat teas.

Sapat has recently introduced a unique concept of natural flavoured tea for the first time in India by the name of **Fantasy**, which is available in three invigorating flavours.

**Mast Masala Tea**- pure Assam tea overflowing with palate-tingling spices... The traditional favourite ! Every sip guaranteed to satisfy the connoisseur in you.

**Romanchak Rose Tea**- the delicate fragrance of natural roses, enhancing the rich flavour of pure Assam tea... A heavenly combination ! **Chust Chocolate Tea**- rich creamy chocolate, delightfully blended with pure Assam tea... God's gift to chocolate lovers !

Available in 100g poly packs, 1 kg.



laminated cartons and 12 pack 'Brew Bags'. Also available Black Gold Tea and Bru Bags, another high quality, high-value brand from Sapat.

ALL NATURAL  
**SAPAT**  
*Fantasy*®  
FLAVOURED TEA

**SAPAT**  
SINCE 1897

For trade enquiries, contact:

**SAPAT PACKAGING INDUSTRY LTD.** 1362/K, Ram Bhuvan, Old Agra Road, Nasik 422 002, (INDIA). Tel: 576188 /573283. Fax: (91) (0253) 576011.



# Rajdeep FULL TOP OPEN ROUND DRUMS & JERRY CANS

made from PURE FOOD GRADE, VIRGIN  
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**FULL TOP OPEN BLUE  
ROUND DRUMS** in 25, 30,  
40, 50, 65, 100 & 120 Kgs.  
capacity. Ideal for Packing &  
Storage of Powder, Granules  
& Solid materials for Dyes,  
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and Food Industry.

**UN** APPROVED

**WHITE/BLUE STACKABLE  
JERRYCANS** in 20, 30 & 50  
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Packing and Transportation  
of Hazardous & Non-  
hazardous Liquid Chemicals.



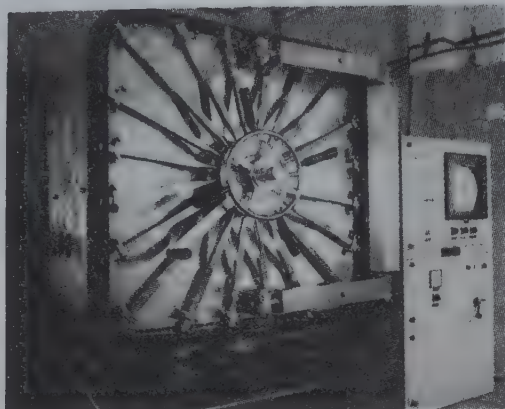
## Rajdeep Plastics

FOR YOUR REQUIREMENTS KINDLY CONTACT  
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## Technology for the FOOD INDUSTRY

Our process allows you to carry  
out the most difficult  
thermal treatment . . .



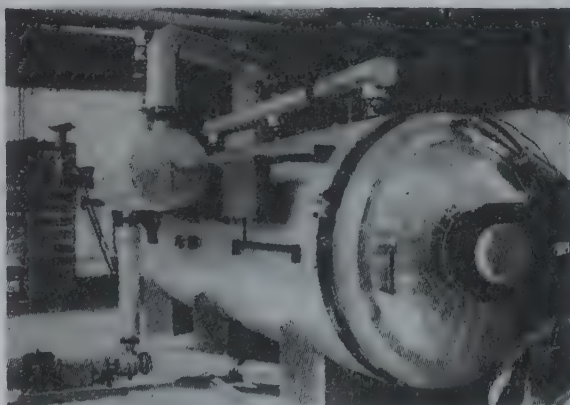
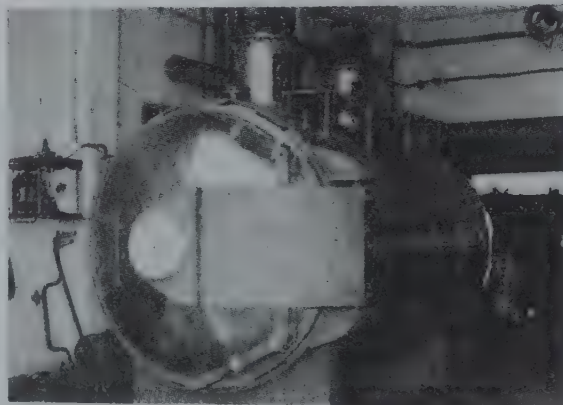
### STEAM RETORTS

conventional process using steam • rugged & resistant hardware with easy & safe operation • quick steam sterilization to avoid damage to heat labile products • air ballasting with rapid cooling for higher productivity.

### VENTILATOR AUTOCLAVE

Our process with forced circulation consists of driving mixture of air-steam around containers by an impeller

- no cold spots • uniform & accurate treatment
- temperature accuracy to  $\pm 0.5^{\circ}\text{C}$  • accurate pressure balancing for most fragile packaging



### SUPER HEATED WATER SPRAY STERILIZER

- heat transfer by water spray • heating & cooling time/temperature ramps adjustable • simplicity of function with only one moving part i.e. pump • perfect reproduction of programmed cycle • optimum heat transfer • no overcooking • shortcomings of HTST overcome

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B-104, Arjun Centre, B. S. Devshi Marg, Govandi, Bombay-400 088. INDIA.  
Tel : 555 5596/556 0947. Telex : 011-61002 MAFP IN, Fax : 91-22-556 0569 Gram : 'STEAMSET'



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FOR FOOD INDUSTRIES

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FOOD PREMIXES

SPECIALLY MADE TO SUIT  
YOUR END-PRODUCT

INDOFARIN FOOD PREMIX FOR ADDED NUTRITION TO PRODUCTS  
LIKE BREAKFAST CEREALS, BREAD, BISCUITS, PROTEIN FOOD, JUICES & OTHER BEVERAGES

Vitamin premixes containing Vitamin A, B, B<sub>2</sub>, C, D, E etc. can be made in dry, oily or liquid forms, to suit your end-product. For further details regarding levels to be added, methods of incorporation etc. please contact directly.

Premixes can also be used in  
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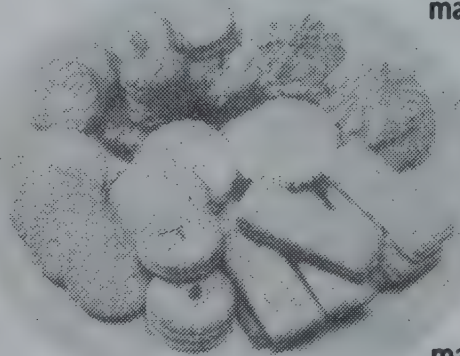
**INDOFARIN A REAL BOOSTER TO YOUR PRODUCT**



# CARAMEL

## *Color*

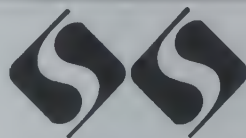
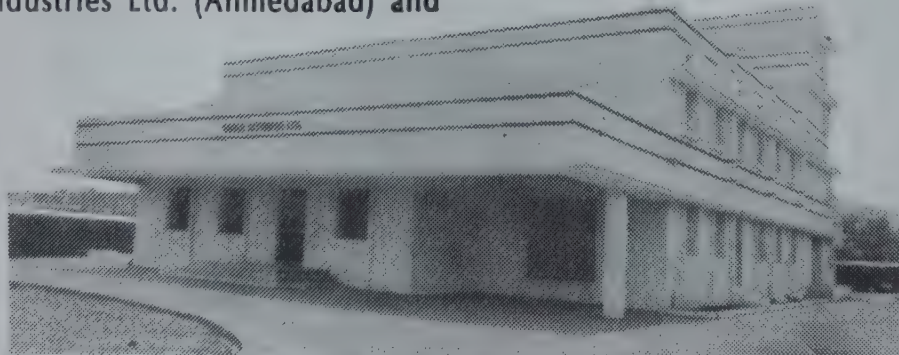
### *The Quest for Quality*



Caramel Color has been used for generations to improve the taste and appearance of foods and beverages. Imparting color ranging from delicate yellow to the darkest browns, it remains a versatile and cost efficient coloring agent.

This unique color is now brought to you by Sayaji Sethness Ltd. - a joint venture company promoted by Sayaji Industries Ltd. (Ahmedabad) and

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#### **CARAMEL COLOR APPLICATIONS**

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Soft drinks  
Beverage products  
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##### **BAKING**

Dark breads  
Cookies  
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Cake Mixes Light

##### **FLAVOURS, SEASONINGS & SAUCES**

Gravy & Gravy Bases  
Seasoning mixes  
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Condiments  
Flavouring Extracts  
Preserves

##### **OTHERS**

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Coffee extender  
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Pharmaceuticals  
Candy/Licorice  
Vinegars  
Dairy Products  
Cereals  
Soups

KNS-ADI





# GOMA

can help you to choose

## RIGHT DIRECTION

in setting up

## TURNKEY PROJECTS

for Dairy, Ice-Cream, Food and Beverage Industries

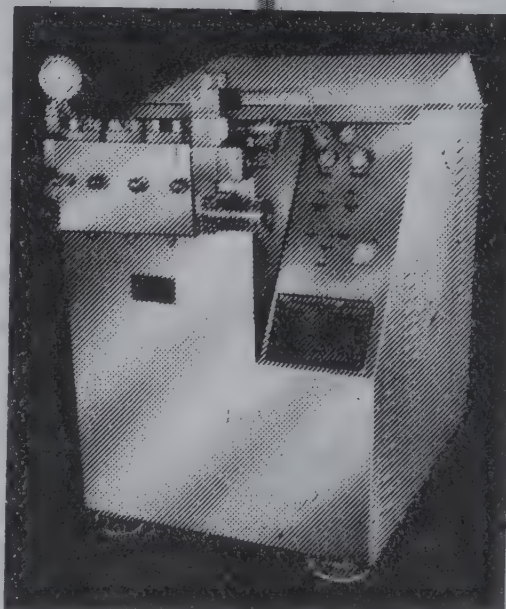


**Goma** Engineering established a decade ago, initially developed 100% indigenous **High Pressure Homogeniser** and successfully launched **Truly, a World Class technology product.**

**Goma** has already installed more than 75 Homogenisers of various capacities ranging from 50 to 18000 LPH through out India in Government Sector, Co-operative, Private Sector and in Multi-National Companies.

**Goma** has also exported Homogenisers to countries like Australia, Russia and Middle East Countries etc. in a period of less than 3 years.

From its humble beginning of developing Homogenisers, now **Goma** has entered into the field of setting up Turnkey Projects for various industries like Dairy,



Ice-Cream, Food and Beverages.

**Goma** is supported by eminent Dairy Technologists and its customer support team which comprises of highly skilled professionals having vast experience in this field.

**Goma** is backed up by insant Customer service department and availability of spares, off the shelf, which is dedicated in keeping the customers production in line.

**Goma brings to you products like**

- ❑ HOMOGENISERS,
- ❑ H. T. S. T. PASTEURIZERS
- ❑ SEPARATORS
- ❑ SANITARY PUMPS.
- ❑ STORAGE TANKS
- ❑ CHEESE, BUTTER, GHEE MAKING EQUIPMENTS
- ❑ REFRIGERATION PLANTS

## A Company that evokes trust.

# GOMA

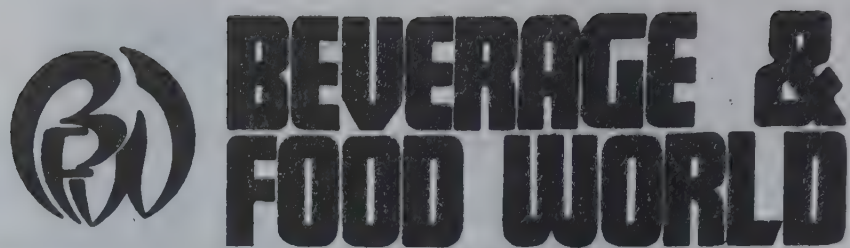
### ENGINEERING PVT. LTD.

Majiwada, Behind Universal Petrol Pump, Thané - 400 601.

Phone No.: 534 0875 / 534 6436 □ Telex : 011-72389 - TCWE IN □ Fax No. : 91-22-533 3634



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**Vol. 23 No. 2**  
**Mumbai**



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# Physico - Chemical and Dehydration Characteristics of Onions: A Review

by

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## Summary

Onion is an important vegetable crop of India having considerable economic significance. India produced 3.35 million tonnes of onions in 1990 and ranked second in the world in terms of production. It exported onions worth Rs. 173 crores in 1992-93 which was more than that of all other fruits and vegetables put together. However, 16-35% of produce is lost at post harvest stages. These losses can be reduced substantially by adopting appropriate post harvest technology and by processing excess produce during the season. Processing extends the shelf life and enhances the value of produce. Dehydration is a simple method of processing which has got an additional advantage of convenience in packing, storage and use of the dehydrated product. But the onion varieties differ considerably in their quality characteristics. Therefore selection of a suitable variety is essential for reducing the post harvest losses and for getting good dehydrated product. This paper reviews the physico-chemical quality, flavour characteristics, storability and dehydration characteristics of onions with particular reference to the Indian varieties.

Onion (*Allium Cepa* L.) is thought to be of Asian origin. It is one of the most important and probably the oldest cultivated vegetable. Onion is liked for its characteristic flavour, taste and pungency. It is used extensively in foods as a table vegetable, in salads and pickles and for flavouring gravies, soups, sauces, chutnies and other similar food items. Leaves and bulbs of green plants are eaten but their use is restricted. Onions are valued mainly for mature dry bulbs because of their culinary properties and long shelf-life. In view of their commercial importance, physico-chemical and drying characteristics of mature bulbs have been reviewed here and the mature onion bulbs have been referred to as onions only in this paper.

Onion has been attributed many medicinal properties and has been mentioned by

Charak in his famous medical treatise *Charak Samhita* of sixth century B.C. It is said to be diuretic, heart stimulant, antirheumatic, hypoglycemic, beneficial to the digestive tract and good for eyes <sup>1,2</sup>. Onion extract exhibits antifungal, antibacterial and antioxidant properties <sup>3,4</sup>.

Onion production has increased steadily over the years from 1.26 million tonnes in 1960 to 3.35 million tonnes in 1990 <sup>5,6</sup>. The World onion production in 1990 was 27.198 million tonnes <sup>6</sup> and India ranked second in the World. Onions are of great economic importance to India. It is consumed mostly within the country, but a substantial quantity is exported also. Value of fresh onion exported in 1992-93 was Rs. 173 crores as against Rs. 54 crores in 1986-87 <sup>7,8</sup>. These

export earnings were more than that from export of all other fresh fruits and vegetables. The economic value of onion can be considerably increased by reducing post harvest losses which are as high as 16-35% under tropical climate <sup>9</sup>, by adopting improved post harvest techniques and processing the onion. Dehydration is the most widely used method of processing onion.

## Physical Characteristics

Onion varieties differ considerably in their colour, shape, size, days required for maturity, pungency, yield and storability. Upov <sup>10</sup> have classified onions into seven shapes, while Van Arsdell and Copley <sup>11</sup> have suggested five shapes only (Fig. 1). Most of the Indian varieties are circular

Table - 1: Physico-Chemical Characteristics and yield of some Indian onion cultivars<sup>11a</sup>

Cultivar	Shape	Maturity (days)	Av. Size dia(cm)	Yield(q/ha)	T.S.S (%)	Pungency	Storability
<b>Red Varieties</b>							
Agrifound Dark Red	CR	95-100	4-6	300-400	12-13	++	++
Agrofound Light Red	CR	160-165	4-6	300-325	13	-	+++
Agrifound Rose	TE	95-100*	-	190-200	15-16	-	-
Arka Bindu	TE	100*	2-4	250	14-16	+++	-
Arka Kalyan	CR	100-110	4-6	335	11-12	-	++
Arka Niketan	CR	145	4-6	340	12-14	+++	+++
Arka Pragati	CR	140-145*	-	200	-	+++	-
Baswant-780	CR	100	-	200-250	11-12	+	++
Hissar-2	CR	165*	-	200-250	12-14	+++	-
Kalianpur Red Round	CR	150-160*	-	250-300	13-14	+++	+++
N-2-4-1	CR	140-145	4-6	250-300	12-13	+++	-
N-53	CR	100-110	-	150-200	11-12	+	+
Punjab Red Round	CR	95-100	-	300	-	-	-
Punjab Selection	CR	-	-	200	14	-	+++
Pusa Madhavi	TE	130-145	4-6	300	-	-	+++
Pusa Ratnar	BC	125	-	300	11-12	+	-
Pusa Red	TC	140-145	-	250	12-13	+	+++
Udaipur-101	TE	150-160*	-	200-300	12-14	+	-
Udaipur-103	BE	150-165*	-	250-300	11-13	++	-
<b>Yellow Variety</b>							
Early Grano	CR	95-100	-	-	6-7	+	+
<b>White Varieties</b>							
N-257-9-1	CR	-	-	high	-	-	+++
Punjab-48(S-48)	TE	-	-	300	-	+++	-
Pusa White Flat	TE	130-135	-	-	12-14	-	+++
Pusa White Round	TE	130-135	-	300-325	12-13	-	+++
Udaipur-102	TE	120	4-6	high	-	-	+++

1: Days after transplanting; \* From the date of Sowing; +++ : Good/strong; ++ : Medium/intermediate; + : Poor/weak or moderately weak; CR : circular (globe) ; TE : Transverse-elliptic (semiglobe) ; BE : Broad elliptic; TC : Transverse narrow elliptic (flat) to Circular; BC : Broad elliptic to circular.

\* Corresponding author





Fig. 1. Shapes of Onion Bulbs

(globe) while some of them are transnarrow elliptic (flat), transverse elliptic (semiglobe or flattish round) or broad elliptic (Table 1). They are generally of red colour. Indian onions mature in 95 to 165 days after transplanting depending upon the variety and agroclimatic conditions. Their diameter ranges from 2.5 to 6.5 cm and yield varies from 150 - 600 quintals per hectare.<sup>11a</sup>

### Chemical Composition

Considerable variations exist in the chemical composition of onions (Table 2). These variations are caused by differences in variety, cultural practices, agroclimatic conditions, and handling and storage practices<sup>11-13</sup>. Moisture, sugars, protein, minerals and vitamins are the main constituents of onion. However, smaller amounts of flavour precursors and lachrymatory factors present in them are of great significance because of their profound effect on the quality of the bulbs.

**Proximate composition:** Moisture is the major constituent of onions. Though a wide range of 78.1-92.8% has been reported, it generally varies within a narrow range of 86-88% (Table 2). Protein content ranges from 0.1-2.0% Paul and Southgate<sup>14</sup> reported 12 amino acids (mg/g nitrogen) in onion - Ile 90, Leu 170, Lys 280, Met 70, Phe 170, Tyr 210, Thr 90, Val 140, Arg 800, Trp 90, His 60 and Glu 930. But they did not find Cys, Ala, Asp, Gly, Pro and Ser. Fat is present in traces (<0.7%) only<sup>14-15</sup>. Total ash content varies from 0.37-0.77% (Table 2).

**Carbohydrates:** Carbohydrates constitute bulk of the dry matter in onion (Table 2). Twelve carbohydrates have been reported to be present in onions stored at 0-3°C for 3-4 months, but glucose, fructose and sucrose together with fructan, were their major sugars<sup>12,16</sup>. Onions contain 1.1 - 3.7% reducing sugars. Ratio of reducing to non-reducing sugars ranges from 0.28 to 1.6, but a low ratio is desirable in order to keep non-enzymatic browning low in dehydrated products. Starch is generally absent in onion<sup>1</sup>.

**Total soluble and insoluble solids:** Total

soluble solids (TSS) of onion varies from 7.0 to 18.5% and water insoluble solids ranges from 1.17 to 2.8%<sup>16,17</sup>. (Table 2). Maini *et al.*<sup>18</sup> reported high alcohol insoluble solids (AIS) content (3.58%). High AIS (>1%) impart good consistency and rehydration properties to the dehydrated onion.

**Minerals:** Onions are rich in calcium and phosphorus but poor in iron (Table 2.) Other minerals like Na, K, Mg, Cu, Zn, S and Cl have also been reported in onion<sup>14</sup>.

Table 2. Proximate Composition of Edible part of Onions

Constituent	Range	Reference
Moisture(%)	78.1-92.8	14-17, 75
Protein(%)	0.9-2.0	15, 75
Calories (Kcal/100g)	23-50	15
Fat (%)	Traces-0.6	14
Ash (%)	0.37-0.77	75
Carbohydrates(%)	8.7-11.6	21-25
Total Sugars(%)	4.5-14.3	16-18, 75
Reducing sugars(%)	1.1-3.7	16-18, 75
TSS (°Brix)	7.0-18.5	16-18, 43, 75
Pyruvic acid (μ mole/ml)	3.25-18.6	17, 18, 43
<b>Minerals (mg/100g)</b>		
Calcium	27.0-46.6	15
Phosphorus	36.0-50.0	15
Iron	0.4-0.7	21, 23, 26
<b>Vitamins</b>		
Vit. A(Iu/100g)	0-50	21, 22, 24-26
β-Carotene (μ/100g)	nil	14
Thimine (mg/100g)	0.03-0.08	21-25
Riboflavin (mg/100g)	0.01-0.12	21-25, 27
Niacin (mg/100g)	0.1-0.4	21-25, 27
Ascorbic acid (mg/100g)	9.0-28.5	19

**Vitamins:** Onion contain good amount of riboflavin but are poor in vitamins A, D and B<sub>12</sub>. Its thiamin content (0.03-0.08 mg/100 gm) was found to be almost equal to its riboflavin content (0.04 - 0.12 mg/100g) (Table 2). Niacin content has been reported to range from 0.1 to 0.4 mg/100 g. Ascorbic acid content of mature bulbs ranges from 9 to 12 mg/100 g but Barakat *et al.*<sup>19</sup> reported much higher values for Egyptian onions (9.5 - 28.5 mg/100g). Saimbhi *et al.*<sup>20</sup> studied varietal variations in ascorbic acid content and its distribution pattern in the bulb. According to them the top half of the

bulb contains more ascorbic acid than the bottom half, and next two leaves contain more ascorbic acid than the inner leaves and the outer leaves to contain the least amount.

**Chemical/Constituents of onion peels:** Outer dry peels of mature bulbs are waste and their disposal is a problem. To examine their utility, the peels were analysed by various workers<sup>28,29</sup> and their major constituents were identified. According to Abdul Fattah and Edrees<sup>28</sup>, the main peel constituents of two onion varieties were : ash (5.7 and 6.2%), lignin (2.9 and 3.5%), lipids (6.8 and 7.8%), sugars (mannitol 0.2% , arabinose 0.24 and 0.35%, xylose 0.17 and 0.37%, rhamnose 3.11 and 8.3%, glucose 3.98 and 14.06% galactose 6.42 and 6.22%), and pectic substances (33.5 and 34.1%). The amount and characteristics of pectins, which is the largest constituent, was found to vary with the variety<sup>29</sup>. Peel pectins of Fateel variety had methoxyl value of 8.17% and jelly grade of 250 while the respective values for Mokawar variety were 4.27 and 200 only. Above studies showed that peel are a potential source of pectin. Bulbs have been shown to exhibit antioxidant activity in pork model system, while peel extract showed this property in palm oil at 0.3% level<sup>4,30</sup>.

**Onion pungency:** The strong characteristic flavour and lachrymatory factors are absent in intact onions; they develop only upon cutting and crushing of the tissues. It indicates that onions contain precursors which are converted into strong smelling volatile compounds by enzymic action. In intact bulbs, since the precursors and enzyme do not come in contact, the strong smell is absent. Though these facts were known for centuries, chemistry of flavour development has been worked out only after advanced analytical tool such as GLC, HPLC and MS became available<sup>31-37</sup>.

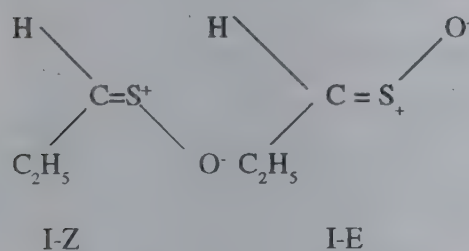
There are many non-volatile sulphur compounds in the intact cells which act as precursor for antibacterial, flavour and pungency compounds of onion. They are non-protein sulphur amino acids collectively referred as S-alk (en)yl cysteine sulphoxides<sup>36</sup>. They are acted upon by the enzyme alliinase to produce flavour compounds. The major precursor isolated from onion is S-propenyl cysteine sulphoxide with smaller amounts of S-methyl cysteine sulphoxide and S-propyl Cysteine Sulphoxide<sup>36</sup> (Table 3). S-Propenyl sulphonic acid, the major lachrymatory factor is also responsible for odour, bitter taste, tongue biting sensation in fresh onion and odour of cooked onion. Its precursor has been found to cause pink discolouration in onion homogenates. Lachrymatory or



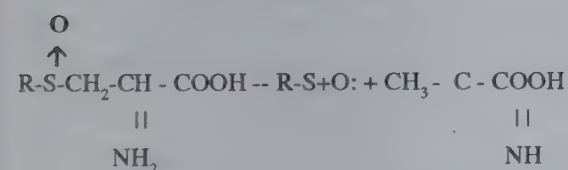
Table 3: S-ALK (EN) YL Cysteine Sulphoxides of allium species  
(Schwimmer, 1971; Whitaker, 1976 ; Lancaster and Boland, 1990)

Type of Precursor	Chemical Formula	Compound	Remarks
S-Methyl Cysteine sulphoxide	$\begin{array}{c} \text{O} \\ \uparrow \\ \text{CH}_3\text{-S-CH}_2\text{-CH(NH}_2\text{)COOH} \end{array}$	(+)-S-methyl-L-sulphoxide	Small amount
S-propyl Cysteine sulphoxide	$\begin{array}{c} \text{O} \\ \uparrow \\ \text{CH}_3\text{-CH}_2\text{-CH}_2\text{-S-CH}_2\text{-CH(NH}_2\text{)COOH} \end{array}$	in onion (+)-S propyl-L-Cysteine Sulphoxide	Medium amount in onion
S-propenyl Cysteine sulphoxide	$\begin{array}{c} \text{O} \\ \uparrow \\ \text{CH}_3\text{-CH=CH-S-CH}_2\text{-CH(NH}_2\text{)COOH} \end{array}$	Trans-(+)-S-(1-Propenyl)-L Cysteine sulphoxide	Major flavour precursor of onion

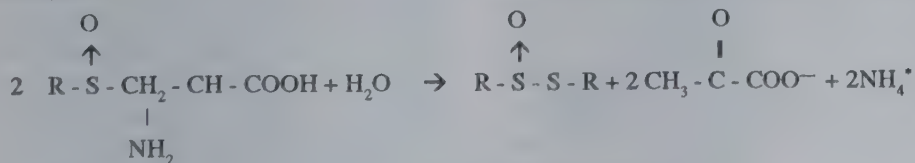
tear-producing factors are formed enzymatically during the hydrolysis of S-propenyl cysteine sulphoxide, and has been identified as 1-propenyl sulphonic acid<sup>36</sup>. Brodnitz and Pascale<sup>31</sup> synthesized thiopropanal S-oxide having similar properties and stiochmetrically it is 19 to 1 mixture of (Z) and (E) - thiopropanal S-oxide<sup>36</sup>.



Alliinase (E.C. 4.4.1.4, S-alk (en)y-L-cysteine sulphoxide lyase) catalyzes beta elimination of the S-alk (en) yl sulphoxide group from the substrate<sup>36</sup>.



Both the reaction products are chemically unstable: the ketimine product spontaneously hydralyzes to pyruvate and ammonia, while the reactive sulphur species combine with various co-reactants within a few minutes of crushing, giving a range of flavour components.



In the case of onion, 1-propenyl sulphonic acid decomposes into several aldehydes and alcohols. At this stage the amount of disulphides and thiosulphonates are very small, but as the time interval of crushing increases, their amount also increases<sup>37</sup>. Within 15 min. of chopping,

ethenol, propanol, 2-methyl butanal and 2-methyl pentanal were found to be present in head space gases and the amount of diprophyl disulphide was very little. But after 60 min, the amount of this disulphide increased substantially and it became a major volatile component after 120 min. In dehydrated onion, methyl propyl disulphide is the major disulphide. Changes in the composition of disulphide during drying modifies flavour of dehydrated onion. Almost 98% of disulphide has been reported to be lost during drying.

Onion contains small amounts of other non-volatile sulphur compounds which are not acted upon by alliinase and do not contribute to its flavour and pungency. Such compounds include  $\gamma$ - glutamyl peptides, S-substituted cysteins and cycloallinin.

Enzymes  $\gamma$ - glutamyl transpeptidase in conjunction with both endogenous and exogenous cysteine (sulphoxide) lyases removes the glutamyl group from  $\gamma$ - glutamyl trans (+) -S- (1- propenyl) - L-cysteine sulphoxide. This liberates the flavour precursor, and increases the rate and extent of pyruvic acid formation and flavour in re-constituted samples of dehydrated onions<sup>38</sup>. This enzyme is not present in dormant onion bulbs. Therefore, in them,  $\gamma$ -glutamyl trans (+)-S-(1-propenyl) cysteine sulphoxide remains unaffected by alliinase and do not contribute to flavour in such bulbs. Transpeptidase is produced in bulbs during sprouting. Addition of this enzyme

to dehydrated onion enhances its flavour.

**Determination of pungency:** Various methods of pungency estimation are based on: (i) subjective analysis of sensory perception, (ii) the estimation of compounds produced by enzymatic action on flavour precursors, (iii) measurement of substrate

concentration, i.e. flavour precursors (iv) alliinase activity, or (v) non specific methods<sup>36</sup>. The objective methods based on determination of chemical oxygen demand<sup>39</sup>, volatile sulphur compounds<sup>40-44</sup>, thiosulphinates<sup>45, 46</sup> or pyruvic acid<sup>46-48</sup> (PA) are more common. Among these methods, estimation of PA is most commonly used as chemical method of evaluating and expressing total flavour and pungency of onion because PA and odour are developed by the same enzyme, i.e. alliinase. Schwimmer and Guadagni<sup>48</sup> found a highly significant correlation ( $r=0.97$ ) between the amount of enzymatically developed PA of juice and olfactory threshold concentration of juice. They found PA to be a fairly reliable, simple and convenient method of estimating at least one aspect of onion flavour. Wall and Corgan<sup>47</sup> also found a significant correlation ( $r=0.79 - 0.92$ ) between PA value and mean sensory rating. Bedford<sup>49,50</sup> developed a sensory method of evaluating onion pungency and found a good correlation between sensory ratings and chemical assesment of pungency. But she<sup>50</sup> preferred chemical tests due to difficulties encountered in sensory evaluation of more than 3 to 4 samples at a time. Onions have been classified into 5 groups on the basis of their PA content ( $\mu$  moles/g fresh wt) and sensory pungency: weak (<5), moderately weak (6-9), intermediate (10-14), strong (15-19) and very strong (>19)<sup>50</sup>. Ratings of Indian varieties on this scale is shown in Table 1. Determination of PA bases on lactate dehydrogenase and NADH coupled reaction or on the 2,4 dinitrophenyl derivitization procedure is probably the most established method of appraisal of onion pungency<sup>52</sup>. The PA content of Indian varieties have been reported to vary over a wide range of 6.1 - 15.7  $\mu$  mole/g juice<sup>17</sup> and 1.7 - 12.8  $\mu$  mole/ml juice<sup>18,53,54</sup>. These values are lower than those reported abroad: 8.3 - 28.5  $\mu$  mole/g<sup>55</sup> and 4-20  $\mu$  mole/ml juice<sup>48, 50</sup>.

**Pigments :** Onions may be divided into 3 groups on the basis of colour - white, yellow, and pink to deep red. The colour of red onions are due to the presence of 7 to 8 types anthocyanins and colour of yellow varieties is largely due to quercitin. Concentration of phenols was found to be higher in red varieties than in white ones<sup>56</sup>. The intensity and hue of colour is affected by variety and agroclimatic conditions prevailing during cultivation and growth of bulbs.

Colour of onions is estimated by extracting the pigments using an appropriate solvent and measuring the OD of the extract. Moore et al.<sup>57</sup> found a combination of ethenol (99 parts) and hydrochloric acid (1



part) to be the best solvent for extracting anthocyanins.

### Storage

Improper storage of onions results in substantial losses<sup>58-78</sup>. Spoilage may be caused by physical factors, physiological changes or pathological factors. Storage losses were also reported to be positively correlated with the protein content of onions and negatively correlated with the percentage of ash, potassium, dry matter, TSS and non reducing sugars<sup>59</sup>. Type and dose of fertilizers used and irrigation schedule also effect the disease resistance of bulbs. Excessive nitrogen application and late irrigation increases their susceptibility to pathogens. Size of bulbs have been reported to influence sprouting and weight loss during storage but the reports are conflicting and inconclusive<sup>59</sup>. Skin colour also affects the storability of bulbs - red bulbs store better than yellow or white ones.

Proper curing of bulbs is essential for good storage. Curing dries outer skin and makes neck thin and tight which reduces the chances of microbial infection. It also aids in the development of proper skin colour. Curing may be carried out in a number of ways; all the methods involve exposure of bulbs to high temperature for a period upto 21 days. Curing period decreases with increase in the temperature but temperatures above 38°C are seldom used because they may cause physiological breakdown<sup>60</sup>. Relative humidity is maintained between 70 and 80%; values below 65% cause loss of skin colour<sup>61</sup>. Curing may be carried out in the field or artificially.

Onion for fresh usage store best at 0°C and 60-70% RH<sup>11</sup>. Fine sand or fine saw dust were reported to be satisfactory media for storing onions for longer periods. Cured bulbs should not be stored on the ground, they should be kept raised off the floor in a well ventilated room. Alternatively, bulbs may be hunge in bunches or in mesh bags. Rotten and sprouted bulbs should be discarded and inspection should be carried out regularly at 3 to 4 week intervals. More frequent inspection is not recommended as increased handling lowers the bulb resistance to diseases<sup>62</sup>.

Berg and Lentz<sup>63</sup> found RH to affect the type of decay; at 98-100% RH neck rot prevailed, while at lower RH range base and scale rot were more common. Firmness, appearance, rotting and sprouting were markedly affected by RH. Relative storability of some of the Indian onion varieties are given in Table 1.

Smittle<sup>64</sup> tried to store onions under

controlled atmosphere (CA) at 1° or 5°C. He found that an atmospheric composition of 5% CO<sub>2</sub> and 3 - 3.5% O<sub>2</sub> gave minimum losses and the bulbs stored early after harvest kept longer than those stored late. The internal atmosphere of the bulbs can also be modified by waxing root plate and neck. The rate of modification of the atmosphere was found to depend upon storage temperature. Since the respiration rate increases with temperature, the elevation of CO<sub>2</sub> level was faster at higher temperature<sup>55</sup>.

Storage of bulbs for 4 months at 28° - 30°C and 40-60% RH resulted in 28 -40% physiological loss of weight, but the weight loss during storage at lower temperature (-2.4° to 4.5°C, 67-85% RH) was minor. Damage or removal of outer dry skin increased the losses upto 90%. Onions may be stored for longer periods by fumigating bulbs with a fumigant like tetrachloroisophthalonitrite before storage or every 2 months during storage<sup>66</sup>. Fumigation allows storage at higher RH of 80 - 90% and 0-20°C. Use of higher RH during storage reduced transpiration losses. Lower percentage of rotting and sprouting were reported for bulbs stored at 0°C. Treating onions in field 2 to 3 weeks before harvest with 30% maleic hydrazide - D or 40 - 80% maleic hydrazide - Na preparation inhibited bulb sprouting, improved storability and reduced transpiration losses. Fumigation with SO<sub>2</sub> or preheating bulbs for 4 hrs at 47°C or 2 hrs at 50°C in a hot air current was reported to reduce the *Aspergillus niger* infection on onions<sup>67, 68</sup>.

Singh and Kumar<sup>17</sup> worked on storage of fourteen Indian varieties at 23° to 30°C for 3 months and found rotting, sprouting and shrinkage to be high (25 to 60%) in the varieties having open neck and low (8 to 25%) in close neck varieties. However, Thamizharasi and Narsimhan<sup>69</sup> observed that the major loss of water occurs through the side and not through the neck. Short day varieties are more susceptible to diseases during storage<sup>70</sup>.

Irradiation of bulbs with 2 - 12 k rad (20 - 120 Gy) was reported to prevent germination, inhibit sprouting and reduces post harvest losses<sup>58, 71-73</sup>. But irradiated bulbs require refrigeration for longer storage. Discolouration of inner butt has been reported to be a major problem in irradiated onion bulbs<sup>58</sup>.

Toledo<sup>74</sup> found varieties with higher fructan content to have better stability and storability. But this criteria was reported to be useful only for identifying cultivars of very short storage life and not for predicting the storability of onions with medium to

long storage life<sup>75</sup>. States of maturity and method of harvesting also affect storage losses<sup>64</sup>.

Storage may affect the quality and yield of dehydrated onions. According to Luh and Kean<sup>76</sup>, storage for 4 months at 10° - 20°C reduced yields of fresh bulbs as well as dried rings. Similar observations were made by Sharma and Nath<sup>54</sup>. Though there were no differences in the quality of dried rings obtained from fresh or stored bulbs immediately after drying, the product from fresh bulbs retained their colour better during 15 months storage at 25°C.

Bottcher<sup>65, 77</sup> studied changes in chemical constituents of onions during 7 to 8 months storage at -2.5° to 4° C. There was no significant change in the dry matters despite weight loss but disaccharides content decreased and monosaccharides and ascorbic acid contents increased. Pungency, in terms of PA, increased during storage primarily due to concentration effect caused by moisture loss<sup>64, 78</sup>, sprouting further increased pungency<sup>37</sup>.

### Methods of Preservation

Onion may be preserved by dehydration, canning, pickling, freezing, french frying, squeezing the juice, roasting and cooking<sup>15</sup>. For canning small (dia < 3 cm) white skinned bulbs are flame peeled, size graded, ends are trimmed, blanched for 4.5 min. in hot water (81°C), filled in C-enamel cans, covered with acidified brine (pH 4.2 - 4.4), exhausted, sealed and processed in retorts at 110°C<sup>76</sup>. Small onion bulbs are pickled in vinegar either alone or along with other vegetables. Onions form a part of the fermented vegetables and other fermented food products of Far East Asian Countries<sup>15</sup>. Peeled onions are put in 10-15% brine for 24 to 96 hr. for fermentation. During this period about 0.5% lactic acid is formed. Brine strength is adjusted to 2% and preserved by adding bisulphite or pasteurization (80°C, 10 min). For freezing white onion bulbs are trimmed, washed and frozen in an air blast freezer either whole or after chopping into 3-6 mm slices<sup>79</sup>. For french frying, mildly pungent medium sized bulbs free from joints and having fleshy rings are selected. They are cut into rings of an appropriate size and deep fat fried as such or after dipping in a suitable batter.

Comminuted fresh onions has been developed by Postner and Maggi<sup>80</sup>. The product consists of 88-92% raw onion cubes of 3-6 mm size, 0.05-0.10% sodium disulphite, 0.1-0.5% tartaric and/or citric acid, 0.05-0.20% ascorbic acid, 0.05-0.20% swelling agent and 0.05-0.15% emulsifier. The product is packed in tubes and pasteurized at 70-



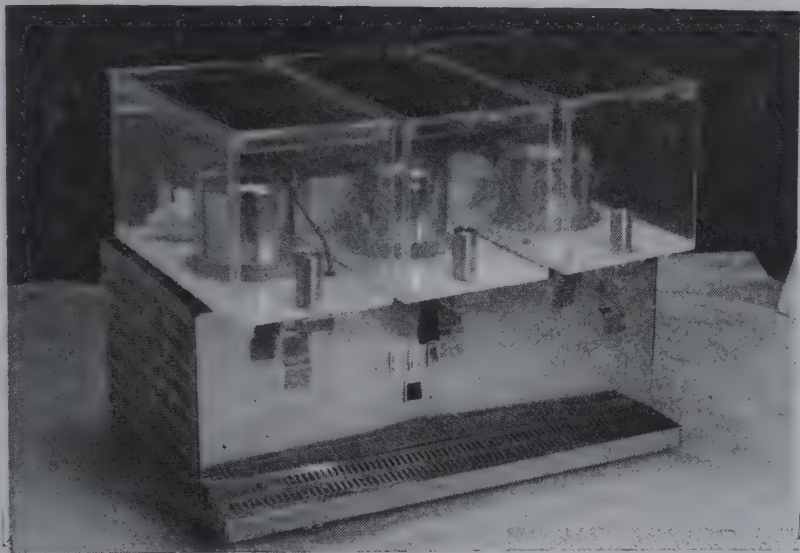
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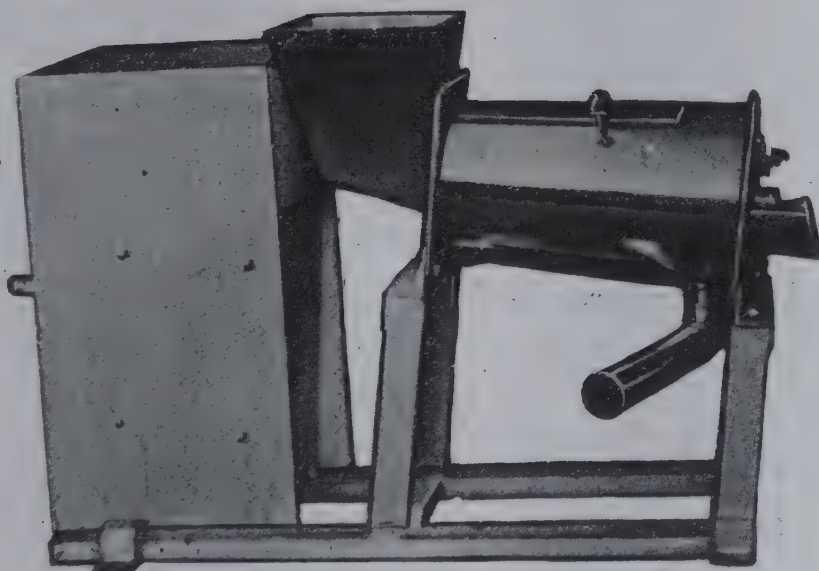
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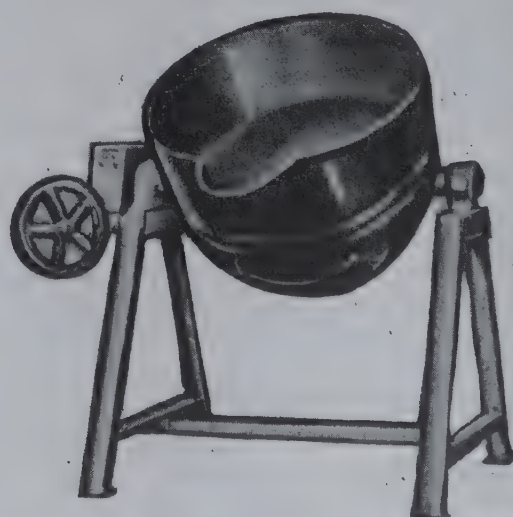
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80°C.

## Dehydration

It is the most important method of onion preservation because it reduces bulk and packaging requirements, and handling and storage of dehydrated onions is easy. Further, it is more convenient to use them. Dehydrated onions are being increasingly used in tomato ketchup, sauces, soups, curries, convenience foods, instant foods, commercial meat products and dog foods. Only a part of dehydrated onions are sold in retail stores; bulk of it is sold for institutional use and remanufacture<sup>81</sup>. Large quantities of onions are dehydrated every year and there are several methods of dehydration. Some of the common steps are: size grading, peeling, trimming, washing, slicing, drying and packaging in an air tight container<sup>1, 17, 82, 83</sup>. Onion bulbs are generally peeled by flame peeling. However, peeling machines employing compressed air/gas jets to blow off and remove outer dry peels have been developed<sup>84-86</sup>. Onions are not blanched. This allows retention of alliinase activity which is responsible for flavour development. Major problems associated with dehydrated onions are: browning, discolouration, scorching, agglomeration, loss of flavour and poor rehydration<sup>18, 82, 87, 88</sup>. Pink discolouration is caused by non-enzymatic browning. These changes take place during drying and/or storage. The extent of the changes depends upon variety, drying method, packing material and storage conditions.

Dehydration does not reduce bacterial contamination. Use of ethylene oxide<sup>89</sup>, brining or H<sub>2</sub>O<sub>2</sub> treatment<sup>13</sup> and  $\gamma$ -irradiation<sup>90, 91</sup> have been suggested for sterilizing dehydrated the product.

**Selection of variety:** Raw material exerts profound effect on the yield and quality of dehydrated onions. Therefore, onions of proper variety should be selected. Some of the quality requirements of fresh onion for dehydration are: (i) high total solids (>15%) for high yield, (ii) White fresh for light coloured product, (iii) high pungency to ensure its sufficient retention in the dehydrated product, (iv) high insoluble solids (>1%) for good rehydration characteristics, (v) low ratio of reducing sugars to non reducing sugars to prevent NEB, (vi) full globe to tall globe shape of bulbs with small thin neck and small root zone to permit easy slicing and low trimming losses, (vii) medium to large sized bulbs (5-6 cm diameter) for easy handling and slicing, (viii) good storability, (ix) low bolting tendency in bulbs, (x) high per hectare yield, and (xi) resistance to diseases and insects both in the field and during storage. On the basis of

these criteria white varieties are preferred for drying. Some of such Indian varieties are: 36-1-3-4<sup>92</sup>, Punjab-48<sup>82, 93, 94</sup>, Pusa White Round and Pusa White Flat<sup>54, 95</sup>, Udaipur-102<sup>17</sup>, S-74<sup>82</sup>, and L-131 and L-124<sup>94</sup>. Pigmented varieties, such as Ropali<sup>18</sup>, Udaipur-101<sup>17</sup> and VL-1<sup>54</sup> have also been reported to be suitable for drying. However, Indian varieties do not compare very favourably with the varieties used abroad for dehydration because of their lower pungency and lower total solids content.

**Drying methods:** Onion may be dried as slices or in the comminuted form. For drying as slices, the bulbs are peeled, washed, trimmed and cut into slices of 3-6 mm thickness. Slices are kept in brine till put for drying. Slices are dried in an air tray drier. In an attempt to check browning during drying, Salam<sup>96</sup> inactivated peroxidase by blanching, but it accelerated browning. Koganko *et al.*<sup>97</sup> suggested a short blanching (0.5 - 1.0 min.) of whole bulbs in hot water (50-70°C), removing surface moisture by blowing air, slicing and drying at 50-55°C with an air velocity of 7-10 m/sec for preserving colour. Soaking for 2 min in tap water or warm (85°C) 2% ethanol or for 24 hrs in 5% NaCl were tried by Farag *et al.*<sup>98</sup> They found soaking in cold water or brine to be most effective in reducing pink discolouration. Edwards<sup>99</sup> dipped 1 mm thick slices in a solution of 0.25% sodium metabisulphite and 0.25% citric acid to produce light coloured dehydrated product. Other processes developed to control pink discoloration are treating onion pieces with a base (ammonium bicarbonate, calcium carbonate, magnesium hydroxide, sodium bicarbonate or sodium tripolyphosphate) before or at an initial point in drying<sup>100</sup>, or adding 0.1-0.3% cysteine and 0.1% ascorbic acid to dried or comminuted product and adjusting pH to 3.0 - 6.0 with citric acid<sup>101</sup>. Repeated infiltration of about 3 mm thick onion pieces with a liquid under vacuum (7-20 inch Hg) loosened their epidermis layer which facilitated their quick drying<sup>102</sup>.

Poor rehydration was found to be caused by cell death in protoplasmic membrane during initial stages of dehydration<sup>103</sup>. Schwimmer<sup>104</sup> found vacuum infiltration of rings or slices with acrylamide to cause *in situ* polymerization and subsequent drying to improve rehydration. But this method was tried under laboratory condition only. In another attempt, addition of an edible surface active agent (methyl cellulose or hydroxy propyl methyl cellulose) to rehydrating water (10-50°C) was found to reduce rehydration time from 45 min to 15 min.<sup>105</sup> Increasing the temperature of water to 81° - 95°C reduces this time to about 5

min.

Solar drying<sup>106</sup>, hot air tray/Cabinet drying<sup>53, 54, 74, 75, 87</sup> fluidized bed drying<sup>107</sup> or freeze drying<sup>99, 101</sup> techniques may be used for drying onions. While solar drying process takes long time, freeze drying is an expensive process. Hot air cabinet drying is commonly employed. Product is dried at 55-60°C for 6-10 hrs to about 5% moisture level.

To get superior quality product, Cabrera *et al.*<sup>108</sup> advocated two stage drying for onion, beginning with air temperature at 75°C for 2 hrs and then decreasing the temperature to 65°C.

**Physico-chemical characteristics of dehydrated onions:** Shrinkage ratio (the ratio between the weight of unprepared onion to that of the dehydrated product) for Indian varieties ranges from 8.1 to 13.1<sup>18, 53, 54, 82, 92, 94</sup>. The reported values for dehydration ratio (The ratio of the weight of prepared onion to that of the dehydrated product) were 5-10. A high rehydration ratio (RR) is desirable for a good quality product and FPO<sup>109</sup> (1955) specifies a minimum value of 5.0. Values of RR reported for different varieties are 4.26 - 6.0.

Much of the original pungency (32 to 93% depending on variety) is lost during dehydration process<sup>17, 18, 53, 54, 108</sup> due to volatilization and chemical changes in the flavour constituents. Freeman and Whenham<sup>110</sup> improved the flavour of dried onions using synthetic ( $\pm$ )-S-1-propyl-L-cysteine sulfoxide and alliinase preparations. Addition of 0.05% propionaldehyde to slices before drying also enhances product pungency<sup>101</sup>. Colour of the product darkened during dehydration, OD of the extract was more than that could be accounted for the presence of pigments in the fresh onions. This is due to non-enzymatic browning taking place during drying operation.

**Storage of dehydrated onions:** Browning and discolouration<sup>81</sup>, loss of pungency<sup>111</sup>, increase of moisture level<sup>87</sup> and loss of rehydration<sup>82, 112</sup> occurs during storage of dehydrated onions. The extent and rate of these changes are influenced by RH and temperature of the storage environment and the length of storage period. Sorption isotherms have been used by various workers to assess their storage and packaging requirement. Warburton and Piixton<sup>112</sup> and Morales *et al.*<sup>113</sup> did not observe any hysteresis. According to the former<sup>112</sup>, 19% moisture content was the upper limit for safe storage. They and Sharma and Nath<sup>114</sup> found that maximum safe RH for storage to prevent mould growth was about 70%. Though Morales *et al.*<sup>113</sup> observed sorption



isotherm to confirm to the BET model, Sharma and Nath<sup>114</sup> found them to be similar to the Type III curve of Brunauer et al.<sup>115</sup> Packing the dehydrated product in impermeable containers or use of inpack dessicant preferably under an inert atmosphere and storage at low temperature (-5 to 5°C) reduces the undesirable changes.

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# Studies On The Membrane Concentration Of Tender Coconut By Water Reverse Osmosis

by

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## Abstract

*Experiments were conducted on the application of reverse osmosis for the preparation of tender coconut water semi-concentrate using different types of membranes viz CA-992, HR-95 and HC-50 in a lab model R.O. Unit (DDS module 20-0.72) and its shelf stability in a suitable packaging system with treatment / additives. Tender coconut water could be concentrated from 5° Brix to 22-24° at 5MPa using all the three membranes. Average permeate flux was found to be 35-45 L/m<sup>2</sup> h depending on membrane type. Rejection values were highest with HR and lowest with HC membranes. Storage studies showed that the tender coconut water semi-concentrate packed in polypropylene pouches was acceptable upto 3 months at room temperature and 37°C when treated with potassium sorbate (0.1%) and sulphur dioxide (450 ppm) and pasteurized in boiling water for 8 min.*

## Introduction :

India ranks third among the coconut growing countries of the world after Philippines and Indonesia producing about 6800 million nuts (1984-85 estimates) forming 15% of the global output. About 57% of the total production is consumed as raw for domestic use, a small portion as desiccated coconut and about 3.5% as tender nuts, with remaining 40 % dried into copra (Krishnankutty, 1987).

Tender coconut water (about 7 months maturity) is a delicious and nutritious natural drink becoming very popular in big cities and tourist spots where its trade has increased tremendously. About 200 million nuts are harvested and consumed for drinking purposes (Krishnankutty, 1987). Around 50% of the coconut produced in West Bengal and Maharashtra is harvested at tender stage for drinking. It is also preferred as a soft drink in Karnataka, Orissa and Tamilnadu. The water with 6.5% total solids and 5.7% soluble sugar contains vitamins and minerals (especially potassium) and serves as an excellent rehydration medium for patients suffering from gastroenteritis. It is therefore increas-

ingly regarded as a "health drink" and preferred over conventional synthetic cold drinks/ beverages.

Transporting the tender nuts to distant places of non-availability makes them very expensive and uneconomical since the water comprises only 20-25% of the weight of the whole fruit. The green whole nut has also very limited shelflife under ambient storage. It could be storage for 4 weeks wrapped in polythylene at 12°C (Maciel *et al.* 1992). However, such pre-packaging and refrigeration add to the cost. There is therefore a need for preserving the water with minimal treatment and additives / preservatives.

Tender coconut water as soft drink was canned or bottled using thermal treatment (pasteurization) with a good shelflife (Krishnankutty, 1987). However, the heat treatment is known to affect the delicate aroma of the water imparting a cooked flavour, besides precipitation of the protein matter necessitating filtration using a filter aid. Addition of nisin combined with limited thermal processing was reported to yield an acceptable shelfstable drink in aluminium cans and flexible packaging (Polypropylene, PP-Nylon-PP) (Srivatsa and Sankaran, 1994).

However, the water as such with its low total solids (5-5.5%) is uneconomical to package and transport and its concentration by suitable means would result in considerable economy and convenience. Conventional thermal vacuum concentration methods are unsuitable for application in view of the loss of the delicate flavour and accompanying cooked flavour, besides being energy intensive. Freeze concentration on the other hand is energy and capital intensive. Comparatively membrane concentration utilizing ultrafiltration and reverse osmosis is low energy process performed at room temperature found useful in concentrating fruit and vegetable juices sensitive to thermal processes and has been studied extensively in recent years (Demeczky *et al.* 1981; Koseoglu *et al.* 1991). There is, however, no reported work on the application of this method to tender coconut water.

This paper reports the result of experiments conducted on the application of reverse osmosis to prepare tender coconut water semi concentrate using different membrane types and on its shelf stability with suitable packaging combined with treatment / additives.

## Materials and Methods :

### Raw material :

Tender coconut of approximately 6-7 months maturity purchased from the local market were used. The nuts were thoroughly washed in potable water, manually cut open at one end with conventional chopping knife and the water collected in a sterile SS vessel.

### Pretreatment :

The tender coconut water was pasteurized by heating to 80°C for 1 min and immediately cooled to room temperature prior to concentration. Alternatively to minimise heat treatment it was treated with 200 ppm KMS prior to concentration to yield a concentration of 450 ppm SO<sub>2</sub> in the semiconcentrate.

### Concentration by R.O. :

The treated coconut water was concentrated using a laboratory model reverse osmosis equipment, DDS lab model 20-0.72 m<sup>2</sup> plate and frame UF-RO system (De Danske Sukkerfabrikker, Nakskov, Denmark) as described earlier by Sheu and Wiley (1983). The separation section consisted of support plates, spacers, drain pipes and membranes, which were assembled and compressed using a hydraulic pump to a pressure of 200 KN (43 MPa) as per instruction manual of the firm.

Feed juice stored in a reservoir was pumped by a positive displacement pump and entered the module at high pressure stream at the rate of 8 lit / min. The permeate was collected from the permeate tube and the concentrate recirculated through the feed tank. The operating pressure during the entire run was maintained at 50 bar (5MPa). The operation was continued till the permeate flow rate was too low (4-6 L/m<sup>2</sup>h).



Four membranes with a total effective membrane area of 0.072 m<sup>2</sup> were installed on the module for each experiment involving water (6 litres) collected from 17-18 coconuts although the full capacity was 40 membranes. Three types of commercial membranes by DDS viz. CA-992, HR-95

square meter per hour (L/m<sup>2</sup>/h) was calculated from the volume of the permeate obtained at 15 min interval during the R.O. process. The average processing capacity (flux) of the membrane was calculated by dividing the permeate volume at the end of each run by the total time of

Table 1: Specification of DDS-RO Membranes and Operating Conditions

Membrane type*	%NaCl Permeability	Water flux (L/m <sup>2</sup> h)**	Recommended Operating Conditions**			Experimental Operating Condition		
			pH	°C	Bar	pH	°C	Bar
CA - 992	10	60-85	2-8	0-30	0-50	4.5-5.1	30-45	50
HR - 95	5	115-155	2-11	0-60	0-60	4.8-5.2	34-37	50
HC - 50	40-60	100	2-10	0-60	0-60	4.7-5.1	32-35	50

\* CA - Cellulose Acetate

\*\* As per firm's operation manual

HR/HC - Thinfilm composite

and HC-50 were employed in the study. The specification of these membranes and the operating condition used are given in Table 1.

The equipment was cleaned in place after each operation by running water for 15 min followed by 0.2% sodium hydroxide solution for 15 min for HR /HC membrane or with 0.6% citric acid for 15 min for CA membrane and finally with tap water for 15 min as per manufacturer's instructions.

#### Analytical Methods :

Percent soluble solids (°Brix) in the feed and concentrate was measured using a hand refractometer of range 0-32° Brix (Erma, Japan). Percent total solids was determined by drying at 70°C to constant weight in a vacuum oven.

Reducing and total sugars were estimated by standard Lane and Eynon volumetric method (AOAC, 1975) and expressed as % dextrose. Titratable acidity was determined by titrating with 0.1 N NaOH using phenolphthalein indicator and expressed as % citric acid. The pH was measured using a digital pH meter (Toshniwal, CL54). Total ash was estimated as per AOAC procedure (AOAC, 1975).

Membrane rejection (R) of any solute was calculated from the equation (Lewis, 1982).

$$R = \frac{C_p - C_f}{C_p}$$

Where C<sub>f</sub> = Concentration of solute in the feed

C<sub>p</sub> = Concentration of solute in the permeate

Permeate flux expressed as litre per

operation.

#### Storage Studies :

The semiconcentrates of SO<sub>2</sub> treated coconut water obtained by R.O. using HR membranes were further treated with potassium sorbate (0.1%), filled in polypropylene pouches (300 g), 60 g per pouch of 100 cm<sup>2</sup>, pasteurized in boiling water for 8 min (temperature at the cold point 85°C), cooled immediately in ice water and further packed in paper (60 gsm) - aluminium foil (0.02 mm) - polyethylene (37.5 micron) laminate pouches. Storage studies were carried out at temperature of 4°C, room temperature (RT : 25-34°C) and 37°C. Samples were drawn every month and pH and organoleptic evaluation were carried out.

Organoleptic evaluation was done after diluting the semiconcentrates with distilled water to the level of feed tender coconut water by a group of 8 panelists drawn from the scientific staff of the laboratory who were familiar with drinking tender coconut

Table 3: Rejection Characteristics and average processing capacity of different R.O. Membranes for concentration of tender coconut water.

Membrane Type	Rejection(%)			Average Flux (L/m <sup>2</sup> h)
	Soluble solids	Reducing sugar (as Dextrose)	Acidity (as Citric Acid)	
HR - 95	94.0	97.0	95.4	35.0
HC - 50	82.0	82.3	72.1	41.87
CA - 992	87.2	88.1	84.8	45.0

Values reported are average of three determinations.

water regularly. The panel rated each sample in random order using a nine point hedonic scale for colour, aroma, taste and overall acceptability (1 for dislike extremely and 9 for like extremely).

#### Results and Discussion :

##### Permeate flux :

Fig.1 shows the comparative permeate flux as a function of feed concentration of tender coconut water using CA-992, HR-95 and HC-50 membranes at 50 bar operating pressure. With all the membranes the permeate flux gradually came down as the feed concentration increased. The decrease in permeate flux (from 78.0 L/m<sup>2</sup>h to 14.0 L/m<sup>2</sup>h for CA, from 72.0 to 5.5 L/m<sup>2</sup>h for HR and from 71.5 to 13.0 L/m<sup>2</sup> for HC) is explained by the increase in the soluble solids concentration of tender coconut water during R.O. process. This increase in concentration of feed liquid increased the osmotic pressure which consequently reduced the permeate flux due to the decrease in driving force which is the difference between the operation pressure and the osmotic pressure. The gradual reduction was also partly due to fouling of the membranes during concentration.

##### Physico-chemical characteristics :

Table 2 shows the physico-chemical characteristics of coconut water

Table 2: Physicochemical Characteristics of tender coconut water semiconcentrate obtained using RO Membranes HR-95, HC-50 and CA-992

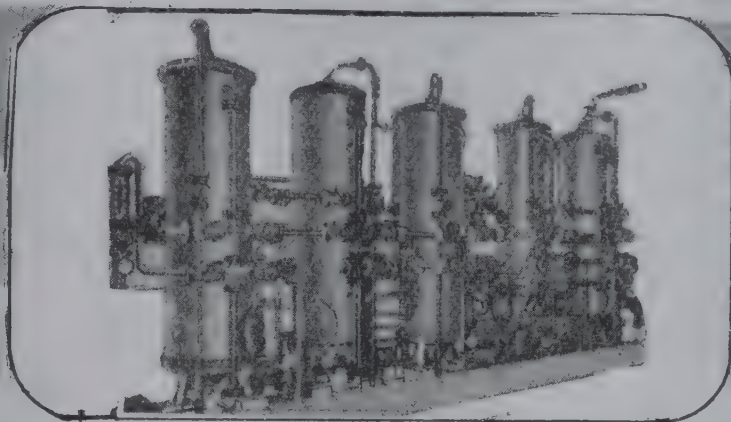
Parameter	HR - 95			HC - 50			CA - 992		
	Feed	Concen- trate	Per- meate	Feed	Concen- trate	Per- meate	Feed	Concen- trate	Per- meate
°Brix	5.0	21.0	0.30	5.0	22.0	0.9	5.5	24.0	0.7
pH	5.14	4.98	5.29	5.03	4.98	4.78	5.05	4.93	4.46
Total solids (%)	5.1	21.2	0.29	5.1	22.6	1.20	5.54	25.0	0.74
Density (g/ml)	1.02	1.09	1.00	1.01	1.116	1.003	1.01	1.11	1.00
Acidity (%)									
(as citric acid)	0.065	0.267	0.003	0.061	0.276	0.017	0.066	0.285	0.01
Brix/Acid	76.9	78.6	100.00	81.96	79.71	52.90	83.33	84.2	70.0
Reducing sugar (%)									
(as dextrose)	4.30	20.75	0.13	4.86	22.5	0.86	4.8	22.5	0.57
Total Sugar (%)									
(as dextrose)	4.5	21.13	—	5.05	22.8	0.87	4.8	22.6	0.58
Total Ash (%)	0.43	1.86	0.15	0.45	1.54	0.35	—	—	—
Yield (%)	—	21.00	—	—	20.00	—	—	16.0	—

Values reported are average of three determinations.



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Table 4: Sensory Evaluation of Coconut Water Semiconcentrate during storage on a Nine Point Hedonic Scale

Period (months)	Storage Temp.°C	pH	Colour	Aroma	Taste	OAA
2	0-4	4.85	7.4±0.5	7.25±0.97	7.25±0.69	7.25±0.69
	RT					
	(20-30)	4.84	7.3±0.7	6.88±0.78	7.00±0.70	7.00±0.70
3	37	4.83	7.0±0.7	6.50±0.86	6.50±0.86	6.60±0.69
	0-4	4.81	7.17±0.69	6.70±0.47	6.50±0.50	6.50±0.50
	RT					
	(20-30)	4.81	7.00±0.7	6.17±0.69	6.33±0.75	6.30±0.72
	37	4.80	5.50±0.76	5.30±0.76	5.40±0.76	5.40±0.75

Initial Values : pH - 4.87 Colour - 7.6±0.73 Aroma - 7.4±0.49 Taste - 7.4±0.49 OAA - 7.5±0.45  
OAA : Overall acceptability.

semiconcentrates obtained using three different membranes namely HR-95, HC-50 and CA-992, in comparison with the feed water. It was found that tender coconut water could be concentrate to 21 to 24° Brix from 5° Brix.. The °Brix and acidity were highest in the permeates through HC-50 showing more losses of both soluble solids and acids. These were followed by the permeates from CA-995 and HR-95 respectively. The pH of the permeate from HR-95 was highest (5.29) showing lowest acidity compared to those from other membranes. There was slight increase in brix-acid ratio of the concentrates compared to the feed liquid in HR and CA membranes due to less loss of acids through permeates of these membranes whereas in case of HC it showed a slight decrease. There was considerable loss of mineral elements estimated as total ash (0.35%) through permeates of HC - 50 compared to that of HR-95 (0.15%).

### Rejection and average processing capacity

It was found (Table 3) that rejection of soluble solids, acids and reducing sugar was highest by HR membrane followed by CA and HC membranes during the concentration of tender coconut water. But the average processing capacity was highest in case of CA (45.0) and lowest in the case of HR membranes (35.0). All the membranes showed permeate flux more than the economically feasible permeate flux of 15 L/m<sup>2</sup>h as suggested by Sheu and Wiley (1983).

### Storage Studies :

Tender coconut water is well known for its delicate organoleptic characteristics. But its shelflife is unknown outside its shell. In-pack pasteurized tender coconut water with the addition of SO<sub>2</sub> (450 ppm) and potassium sorbate (0.1%) could be kept for 3 month at RT and 37°C, as shown in Table 4. However, at 37°C, colour, aroma, taste and overall acceptability were considerably lower compared to RT samples. During the period of storage change in pH was negli-

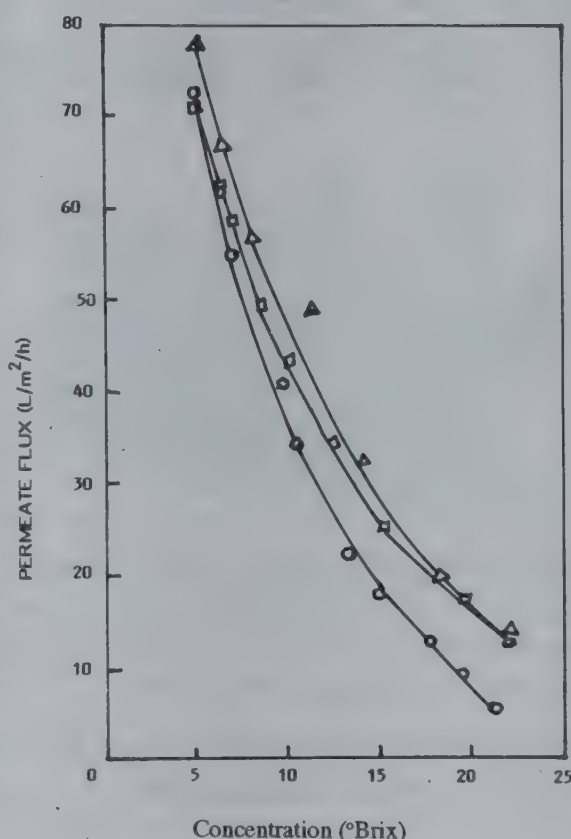


Fig. 1. Permeate Flux as a function of feed concentration of tender coconut water using CA-992 (Δ-Δ), HR-95 (O-O) and HC-50 (□-□) RO Membranes at 50 Bar Pressure.

gible.

### Conclusion

The data obtained from this study showed that tender coconut water could be concentrated from 5° Brix to 22-24° Brix at 5MPa using laboratory scale R.O. equipment removing 80-85% water without much change in organoleptic characteristics as well as in the constituents. HR membranes showed the highest retention of all the constituents.

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# Effect of Variety and Storage on Cut-Out Attributes of Canned Sag

by

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## Abstract

The external and internal can conditions remained almost satisfactory except for rusting of the outer surface in few cans stored under low temperature (0-4°C). The vacuum in cans averaged 11" (0.38 kg/cm<sup>2</sup>) Hg with a range of 8-13" (0.28-0.45 kg/cm<sup>2</sup>) Hg during 28 weeks of storage. Satisfactory can conditions indicated the adequacy of the processing conditions adopted for canning of sag. Sensory quality of sag immediately after canning showed the high acceptability of all the varieties tested for canning.

## Introduction

Rural folks of Punjab are cultivating and relishing the mustard greens in the cooked form since several centuries back, although the historical evidence for the start of home cooking of sag is not available and it may be as old as the ancient civilization of Indus river. People in the earlier times, though relished this delicious vegetable, during winter months, yet they were not aware of its nutritional importance. Compositional studies on fresh leaves shows that mustard greens are rich source of vitamins such as carotene, ascorbic acid, riboflavin, folic acid and minerals as calcium and iron (ICMR, 1993). Another reason for popularity of these green leafy vegetables among rural folks was: as the vegetable is cooked in winter and mixed with home made butter/ghee, it could be kept at the existing low room temperature of winter months for a number of days without showing any sign of spoilage or flavour deterioration. It is heated every day before serving and same lot continued over a couple of days when taken with *chapati* made up of whole maize flour (*Makki-ki-roti*).

Now-a-days, a number of varieties of mustard, i.e. *Raya sarson*, *Toria*, etc. are grown. Chinese cabbage and *Gobhi sarson* are also becoming popular. Leaves and tender stems extensively used for sag-making before crop is thinned thereafter and allowed to mature for seeds for oil extraction. Mustard oil is used for edible purpose. Seeds are known to have medicinal value (Shankaranarayana *et al.*, 1982)

The present investigation on canning

studies from different commercially cultivated *Brassica* varieties was undertaken with the objective to find out processing suitability of individual varieties for the benefit of processing industry.

## Materials and Methods :

Five varieties of *Brassica* greens, namely, *Toria* - ITSA, *Brown sarson*, Chinese cabbage, RLM-240 and *Gobhi sarson* grown at the Oilseed Research Farm of the Department of Plant Breeding of Punjab Agricultural University, Ludhiana were used in the present investigation. Other ingredients such as spinach, tomato, spices, salt and vegetable (vanaspati) fat used in the preparation of sag were purchased from the local market.

Experimental batches of sag for canning were prepared. Fresh green leaves with tender stems of *Brassica* were obtained daily for processing. The lots were sorted, washed and chopped. Spinach leaves were also processed in the same way.

Weighed lots of chopped material along with salt were cooked in water for 50-60 min in a steam jacketed stainless steel kettle with continuous stirring. This was followed by mashing in a mechanical grater. Cooked sag was thickened with maize meal

which was homogenously blended with the crushed mass. Chopped onion, ginger and garlic were fried in fat till light brown. Mashed tomatoes along with fried ingredients were incorporated into the cooked vegetable and mixed uniformly.

Cooked sag was packed manually in A1 tall cans, steam exhausted (10 min), seamed, autoclaved for 55 min at 15 PSI (121°C), cooked and stored at ambient room (10-39°C) and refrigeration (0-4°C) temperatures for periodic physico chemical analysis and cut out examination and sensory quality following standard procedures as described by Ranganna (1986).

## Results and Discussion :

The data on the effect of variety and storage on the external and internal can condition, vacuum, head space and drained weight of can are presented in Tables 1 and 2. The external and internal can conditions remained satisfactory during the 24 weeks under ambient condition and in a refrigerator. Some rusting on the exterior of the cans kept in the refrigerator was observed which was attributed to condensation of moisture which usually happens at low temperature (Table 1). The gross and drained weight of the cans remained practically unchanged

Table 1. Effect of variety and storage on the external and internal can conditions of processed sag

Storage (weeks)	Canned Sag									
	Toria - ITSA		Brown sarson		Chinese cabbage		RLM-240		Gobhi sarson	
	RF	RT	RF	RT	RF	RT	RF	RT	RF	RT
EXTERNAL CAN CONDITION										
In	S	S	S	S	S	S	S	S	S	S
4	S	S	S	S	S	S	S	S	S	S
8	S	S	S	S	S	S	R <sub>s</sub>	S	S	S
12	S	S	R <sub>s</sub>	S	S	S	R <sub>s</sub>	S	S	S
16	R <sub>s</sub>	S	S	D	S	S	S	D	S	S
20	R <sub>s</sub>	S	R <sub>s</sub>	S	R <sub>s</sub>	S	R <sub>s</sub>	S	R <sub>s</sub>	S
24	R <sub>M</sub>	S	R <sub>M</sub>	S	R <sub>s</sub>	S	R <sub>M</sub>	S	R <sub>s</sub>	S
INTERNAL CAN CONDITION										
In	S	S	S	S	S	S	S	S	S	S
4	S	S	S	S	S	S	F <sub>L</sub>	S	S	B <sub>L</sub>
8	S	S	S	S	S	S	S	S	F <sub>L</sub>	S
12	S	S	S	B <sub>L</sub>	S	S	S	S	S	S
16	F	S	B <sub>L</sub>	S	S	S	S	F <sub>L</sub>	S	S
20	S	F	S	S	B <sub>L</sub>	B	S	B <sub>L</sub>	S	S
24	S	S	S	B <sub>L</sub>	S	B <sub>L</sub>	S	B <sub>M</sub>	S	B <sub>L</sub> F <sub>L</sub>

RF = Refrigerated (0-4°C)

RT = Room (10-30°C) temperature

In = Initial

S = Satisfactory

F = Feathery; L = Less, M = More; B = Blackening.



(Table 2). The mean value for vacuum was 11.6" (0.40 kg/cm<sup>2</sup>), Hg at the initial stage which decreased to 9.9" (0.34 kg/cm<sup>2</sup>) Hg at the end of 24 weeks. Raina *et al.* (1982) and Mudhar *et al.* (1985) also reported some decline in can vacuum during storage. Existence of sufficient vacuum shows the adequacy of processing conditions employed during canning of *sag*. Head space of canned samples remained almost the same during storage at room temperature as well as in refrigerated samples (Table 2).

Sensory analysis showed the high suit-

of the cans. It was inferred that ambient storage of canned *sag* was suitable to retail sales distribution and marketing of the product.

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Table 2. Effect of variety and storage on the vacuum, head space and drained weight of canned *sag*

Storage period (weeks)	Canned Sag											
	Toria - ITSA		Brown sarson		Chinese cabbage		RLM-240		Gobhi sarson		Mean	
	RF	RT	RF	RT	RF	RT	RF	RT	RF	RT	RF	RT
VACUUM AS Hg"												
In	8.0	8.0	12.0	12.0	11.0	11.0	14.0	14.0	13.0	13.0	11.6	11.6
4	8.0	8.0	12.0	11.0	11.0	11.0	13.0	15.0	12.5	12.0	11.3	11.4
8	8.0	8.0	12.0	10.0	11.0	10.0	12.5	13.0	12.2	12.1	11.1	10.6
12	7.0	8.0	11.0	10.0	11.0	10.0	12.0	11.0	12.0	12.0	9.8	10.2
16	7.0	7.0	10.0	10.0	9.0	9.0	11.5	11.5	11.5	11.5	9.8	9.8
20	7.0	7.0	11.0	11.0	9.0	8.0	11.0	12.0	11.5	11.5	9.9	9.9
24	7.0	7.0	11.0	11.0	9.0	8.0	11.0	10.0	11.5	11.0	9.9	9.4
Mean	7.4	7.6	11.3	10.7	10.1	9.5	12.1	12.4	12.0	11.9	10.5	10.4
HEAD SPACE AS 1/32"												
In	5.0	5.0	5.0	5.0	9.0	9.0	5.0	5.0	9.0	9.0	6.6	6.6
4	5.0	5.0	6.0	6.0	9.0	8.0	5.0	5.0	8.0	9.0	6.6	6.6
8	5.0	5.0	6.0	6.0	9.0	9.0	5.0	6.0	8.0	8.0	6.6	7.0
12	5.0	5.0	6.0	6.0	9.0	10.0	5.0	6.0	8.0	8.0	6.6	7.0
16	4.0	5.0	6.0	7.0	9.0	10.0	6.0	6.0	8.0	8.0	6.6	7.2
20	6.0	6.0	7.0	7.0	10.0	10.0	6.0	6.0	7.0	8.0	7.2	7.4
24	6.0	6.0	7.0	8.0	10.0	10.0	6.0	7.0	7.0	8.0	7.2	5.6
Mean	5.1	5.3	6.1	6.4	9.3	9.4	5.4	5.9	7.9	8.4	6.8	6.8
DRAINED WEIGHT PER CENT												
In	86.0	86.0	86.1	86.1	86.1	86.1	86.9	86.9	85.7	85.7	86.2	82.2
4	86.5	86.1	86.3	86.1	86.4	86.3	86.9	86.8	86.1	85.9	86.4	86.2
8	86.5	86.5	86.3	86.1	86.4	86.3	86.9	86.8	86.3	86.1	86.5	86.4
12	86.0	86.4	86.4	86.4	86.2	86.2	86.6	86.8	86.3	86.3	86.3	86.4
16	85.8	86.6	86.3	86.6	86.3	86.3	86.7	86.8	86.1	86.2	86.2	86.5
20	85.9	86.5	86.1	86.5	86.1	86.3	86.8	86.7	86.2	86.2	86.2	86.4
24	86.0	86.6	86.0	86.7	86.2	86.2	86.8	87.1	85.8	86.3	86.2	86.6
Mean	86.1	86.4	86.2	86.4	86.4	86.2	86.8	86.8	86.1	86.1	86.3	86.4

In = Initial; RF = Refrigeration (0-4°C); RT = Room (10-39°C) temperature

ability of all the varieties investigated for processing into canned *sag* (Fig. 1). Sensory characteristics of canned *sag* immediately after canning was in the order : RLM-240 > Chinese cabbage > Brown sarson > Toria - ITSA > Gobhi sarson. Overall sensory quality of the canned *sag* indicated that all the varieties were quite acceptable when evaluated immediately after canning.

Low temperature storage (0.4°C) showed no special advantage as compared to storage of canned *sag* at room (10-39°C) temperature regarding the physical conditions

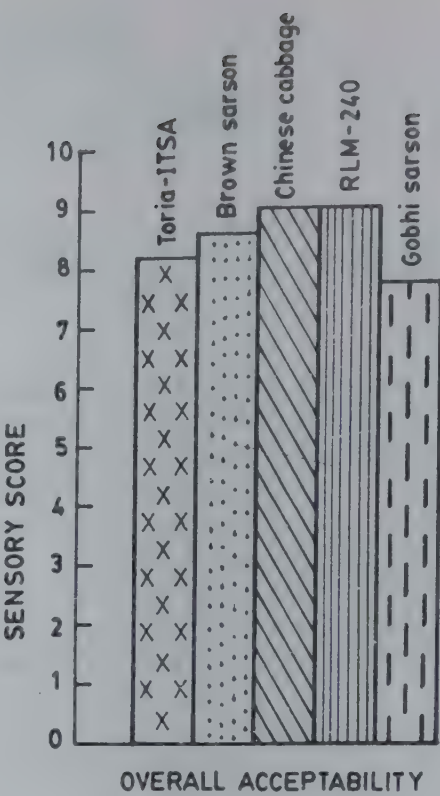


Fig.1 Sensory quality of canned *sag*

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# Storage Of Mango-Papaya Blended Pulp In Glass Containers

by

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## Abstract

The papaya pulp was blended with Banganpalli and Totapuri mango pulps in the ratio of 1:1, 1:2 and 1:3 for enrichment of pigment and economic viability. The blends were stored well with 1000 ppm SO<sub>2</sub> in wax sealed glass containers upto 12 months at ambient temperature (15-37°C). There was not much change in TSS and acidity during 12 months of storage but reducing and total sugars went up in all pulp and blend samples. Likewise, total carotenoids declined in all the samples but more so in Totapuri blends.

Pure papaya pulp had relatively lower consistency and on storage produced more decanted fluid. The pigment fortification by papaya was marginal only in case of 1:1 blend with Banganpalli which was not consistent during storage. However, the economic viability of Banganpalli blended with papaya showed better potential as compared to Totapuri because of better blending compatibilities of the former. Besides lower price of papaya fruit, its pulp percentage is about 80% which makes it cheaper compared to mango pulp.

## Introducing

Mixed fruit punch or blends are increasingly being put into the retail market by the fruit beverage industry in developed countries (Anon. 1994). The objectives may include improvement in appearance, flavour or nutritive value or consumer accreditation. It could utilize, in combination, fruits of lesser economic value or otherwise unsuitable as such for beverage processing. Begum *et al.* (1983) claimed encouraging results from squash of pineapple and mango pulp mixture in the ratio of 25:75, 50:50 and 75:25. Similarly 48 samples of jam blends of mango with a variety of fruits were evaluated for consumer acceptability (Burhan Uddin, 1993). Since the first step of processing in the beverage industry involves storage of pulp, it was thought prudent to study the preservation of blended pulp of mango and papaya. The conditions for storage of mango pulp were established in earlier studies (Kalra and Tandon, 1985a) but preservation of papaya pulp as such or in combina-

tion with mango pulp needed to be corroborated. The main objective sought to be achieved by blending mango with papaya pulp were fortification of pigment, economic viability mango products or to meet consumer demand for newer and better products. So, the pulp of two commercial cultivars of mango, i.e. Banganpalli and Totapuri, were blended with papaya pulp in different ratios and evaluated during storage for a year.

## Materials and Methods :

The ripe fruits of mango, Cvs. Banganpalli and Totapuri, along with commercial papaya were purchased from the local market. Their pulp was extracted, homogenised with 20 per cent water and heat sterilised at 78°C (Kalra and Tandon, 1985a). The pulp was then allowed to cool to approximately 50°C at room temperature and the acidity was adjusted to 0.7 per cent with anhydrous citric acid. Potassium metabisulphite was added as a preservative equivalent to 1000 ppm SO<sub>2</sub>. The mango and papaya pulps were blended in the ratio of 1:0, 1:1, 2:1, 3:1 and 0:1 and filled into 1kg presterilized rectangular glass jars with glass lid. The jars were sealed with molten wax and stored at ambient temperature (15°-37°C). There were 3 replications and the samples were analysed after 0, 4, 8 and 12 month of storage. Total soluble solids in the blends were estimated by hand refractometer (BS&B) and acidity by titrating 0.1 N NaOH using phenolphthaleine as an indicator. Reducing sugars (AOAC 1975) and total sugars (Roughan and Batt, 1968) were assayed colorimetrically. For total carotenoids, 2g pulp was diluted with 0.1g MgCO<sub>3</sub>, 1-2 ml of water and extracted thrice with 15 ml acetone and filtered through a wad of cotton. The filtrate was agitated with 15 ml of petroleum ether and 15 ml of 2 per cent NaCl in a separatory funnel and non-aqueous layer was collected. The non-aqueous portion was rinsed twice with 2 per cent NaCl and the volume was made up to 50 ml with 3 per cent acetone in petroleum ether (Tandon *et al.*, 1988). The colorimetric reading was recorded at 452nm. Total SO<sub>2</sub> was determined by Ripper's iodometric titration method (Ranganna, 1986). All the data were expressed on fresh weight basis.

## Results and Discussion:

The industries generally store fruit pulp or concentrate for eventual conversion into beverages and other products. The storage conditions for mango pulp have been worked out under different environments (Kalra, 1982; Kalra and Tandon, 1985 b; Kalra and Chadha, 1986; Rantos *et al.*, 1993) but papaya pulp and its blends with mango needed authentication. All the pulp and blend samples stored well with 1000 ppm SO<sub>2</sub> under ambient conditions. There was no apparent spoilage or deterioration in colour. Evaluation of chemical characteristics also confirmed that there was no significant retrogression in quality of mango pulp or its blends with papaya. In case of Banganpalli, there was a slight increase in TSS while the titrable acidity decline during 12 months of storage except in pure

Table 1 : Some chemical changes during storage of Banganpalli mango-papaya blends

Storage period (months)	Mango-Papaya pulp ratio				
	1:0	1:1	2:1	3:1	0:1
TSS (%)					
0	13.8	10.7	11.0	12.0	8.0
4	14.0	11.0	11.4	12.0	8.5
8	14.7	11.3	12.2	12.9	8.4
12	14.4	11.3	12.5	13.0	8.7
Titrable acidity (%)					
0	0.62	0.66	0.74	0.72	0.68
4	0.61	0.64	0.67	0.64	0.67
8	0.62	0.60	0.66	0.65	0.67
12	0.62	0.63	0.61	0.61	0.64
Reducing sugars (%)					
0	3.02	2.90	3.13	3.51	2.86
4	3.79	3.45	3.65	3.78	2.90
8	5.08	4.23	4.25	4.26	4.49
12	5.64	4.23	3.79	4.05	3.09
Total Sugars (%)					
0	9.91	7.14	7.47	6.84	4.66
4	10.85	8.28	10.36	8.86	4.72
8	13.85	9.40	11.04	10.37	7.44
12	13.00	11.25	10.22	10.18	6.55
Total carotenoids (µg %)					
0	884	927	773	735	1044
4	878	835	785	746	923
8	867	796	790	777	1034
12	815	790	781	748	819
Total SO <sub>2</sub> (ppm)					
0	978	902	987	954	1148
4	686	722	686	687	866
8	545	767	625	580	633
12	340	552	325	315	609



mango pulp (Table 1). However, it did not manifest into diminution in quality on prolonged storage as the changes were marginal. Reducing sugars constituted around 3 per cent in the processed Banganpalli mango pulp while papaya pulp contained slightly less than 3 per cent reducing sugar at zero time. The reducing sugars augmented progressively in mango, papaya and their blends during 12 months of storage. It may be due to the breakdown of sucrose and other non-reducing sugars during storage. This is in conformity with the observations noted by Kalra and Tandon (1985a) and Ranote *et al.* (1993) during storage of Dashehari mango pulp. However, there were also significant increases in total sugars during storage which could be due to the degradation of insoluble polysaccharides like hemicelluloses, oligosaccharides etc.

Total carotenoids declined slightly during storage in pure mango and papaya pulps and their 1:1 blends but there was no change in the other two treatments (Table 1). However, no fortification in the blended pulp was apparent in terms of total carotenoids excepts in 1:1 pulp blend at zero time and that advantage also disappeared during storage. This may indicate that mango

pigment had more yellowish colour intensity as compared to papaya pulp carotenoids. In essence, there was no augmentation of carotenoids through blending of mango and papaya pulps.

The variation in carotenoid values at zero time in the blended samples could be due to the difference in the papaya lots procured from the market. Total SO<sub>2</sub> level dropped significantly in almost all the samples after 12 months storage under ambient conditions. No spoilage of any pulp sample was observed during storage.

The trends in quality changes in Totapuri-papaya pulps were similar to that of Banganpalli. Totapuri pulp had lower TSS, total and reducing sugar contents as compared to Bangapalli mango pulp but here also, reducing sugars jumped during 12 month storage (Table 2). Total sugars were only 60 per cent of TSS of which less than 30 per cent were the reducing sugars. Total carotenoids of Totapuri mango pulp were only two third after 12 months of storage and there was significant fall of the pigment in the blends. That could mean that the product from such blends would have impoverished appearance. Surprisingly, pure mango and papaya had better retention of carotenoid contents throughout the experimental period as compared to their blends.

All the blends displayed good preservation with 1000 ppm SO<sub>2</sub> in wax sealed glass jars under ambient conditions without much deterioration in quality. These maintained almost original appearance and marginally lower but acceptable flavour. The stored samples were utilized after 0, 4, 8, and 12 month period for beverage preparation which was of good quality. Papaya pulp was also miscible with other mango varieties like Dashehari and Chausa. It was indicated that 25-33 per cent inclusion of papaya pulp in mango beverage preparation did not affect the quality and acceptability of the beverage. (Kalra *et al.*, 1991). However, some economic gain is possible depending upon the prevailing prices of mango and papaya. Papaya is richer in Vitamin C and the beverage could be more nutritive,

besides providing variable products in the markets.

## Acknowledgement

Authors wish to thank the Director, CISH, Lucknow for providing the necessary facilities.

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Table 2 : Some chemical changes during storage of Totapuri mango-papaya blends

Period (months)	Mango-Papaya pulp ratio				
	1:0	1:1	2:1	3:1	0:1
TSS (%)					
0	9.5	8.1	8.8	8.7	8.0
4	9.5	8.4	8.8	8.8	8.5
8	10.0	9.0	9.0	9.0	8.7
12	9.9	8.0	9.2	9.0	8.7
Titrable acidity (%)					
0	0.74	0.77	0.76	0.70	0.68
4	0.74	0.75	0.69	0.67	0.67
8	0.56	0.75	0.69	0.57	0.67
12	0.64	0.75	0.68	0.66	0.64
Reducing sugars (%)					
0	1.85	1.99	2.15	2.08	2.86
4	2.64	2.19	2.29	2.57	2.90
8	3.32	3.63	3.13	2.50	4.50
12	3.29	2.75	2.88	3.31	3.43
Total Sugars (%)					
0	5.99	5.35	4.19	4.04	4.66
4	6.29	5.49	5.32	5.06	4.72
8	6.35	6.70	6.57	6.76	7.44
12	6.20	5.92	6.21	7.02	6.55
Total carotenoids (µg %)					
0	931	678	775	824	1044
4	815	728	781	752	923
8	816	578	777	713	1034
12	693	419	488	490	819
Total SO <sub>2</sub> (ppm)					
0	980	1000	871	966	1148
4	462	578	751	855	866
8	502	484	728	694	633
12	569	484	725	671	609

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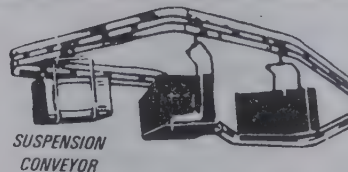
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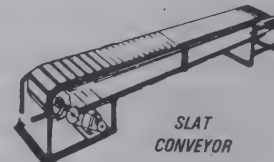
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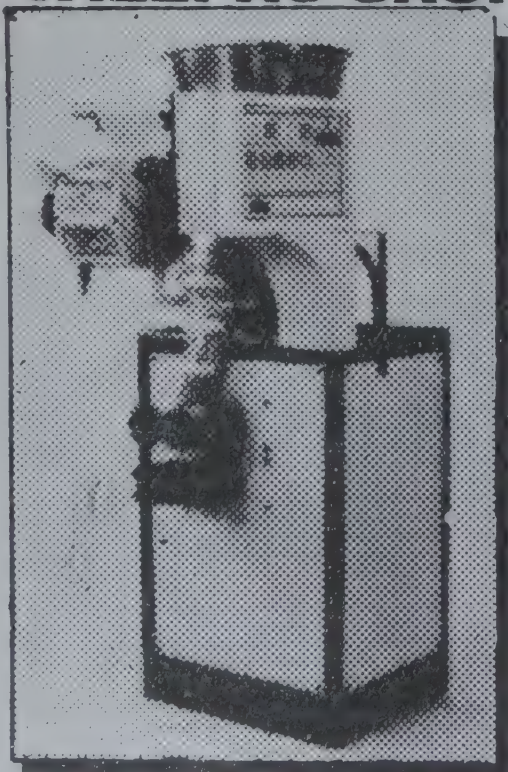
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# India's New Business Environment

Today, investing in India's foods processing industry is made much easier in a new business environment. Foreign equity up to 100 percent is allowed and the use of foreign brand names/trade marks for sale of goods in India has been permitted. There are many special incentives for foreign investors going into exports and road to getting an approval for a business proposal is simple and fast.

India's new industrial policy was enacted in July, 1991. It paved the way for more policy changes, encouraging more foreign direct investments. The Ministry of Industry in India reported that from the time the industrial policy was enacted till August 31, 1994, the government has approved 214 proposals for foreign direct investment and 61 proposals for technical collaboration in the food processing sector. This amounts to a total foreign investment of US \$565.6 million.

India's food processing industry (excluding milk food, malted foods, flour and items reserved for the small scale sector), is one of the 34 high priority areas under the New Industrial Policy. This means that investment proposals in these areas, that involve up to 51 percent foreign equity, receive automatic approval within 2 weeks. Applicants only need to submit the form FC (RBI) to the Reserve Bank of India. Approval is normally granted within 15 days. Also eligible for this facility are soya products and all items of packaging for food processing industries, excluding the items reserved for the small scale sector.

Other foreign investment proposals in the food processing industry that do not fall under the category of automatic approvals are considered on merit, and given fast tract clearance by the Foreign Investment Promotion Board. Applications for setting up an EOU have to be filed with the Secretariat of Industrial Approvals while applications for an EPZ unit have to be filed with the Development Commissioner of the EPZ concerned.

There are no requirements for obtaining industries licenses for setting up or expanding capacity in a food processing industry. This is provided that the unit is not located within 25 kilometers

## Industries in the food processing sectors reserved for the small scale sector

### Food

Ice cream  
Pickles & Chutneys  
Vinegar, Rice milling  
Dal (Pulse) milling  
Bread, Biscuit  
Pastry, Confectionery excluding chocolates  
Poultry feed except in pellet form  
Synthetic syrups, Saccharin.

### Packaging material

Waxed paper  
Corrugated paper and boards  
Paper bags  
Paper cups, plates

## Exchange Controls

The repatriation of profits is freely permitted, except for 22 specified industries. Of the 22, there are 11 industries in the food processing sector. These are :

1. Manufacture of food and food products
2. Manufacture of dairy products
3. Bran mill products
4. Manufacture of bakery products
5. Manufacture and refining of sugar (Vacuum pan sugar factories)
6. Production of common salt
7. Manufacture of hydrogenated oil (vanaspati)
8. Tea processing
9. Coffee
10. Distilling, rectifying and bleaching of spirits, wine industries, malt liquors and malt, production of country liquors and today
11. Soft drinks and carbonated water industry

of the periphery of the standard urban area limits of a city with a population of more than 1 million, as shown by the 1991 Census. However, there are licensing requirements for the distillation and brewing of alcoholic drinks and the manufacture of sugar, animals fats and oils.

A number of processed food items and alcohol such as shrimps, meat, tomato paste products, tropical fruit juices, pulps and concentrates and preserved mushrooms, have been identified as thrust areas for exports. To encourage the development of agro-based industries, the government has exempted agro-based products like sauces, ketchup, butter, cheese, skimmed milk powder, vegetables oils, jams, jellies and pickles, canned fruits and dried vegetables, certain soya products, starches and preparations of meat and fish, from excise duties entirely.

Ever since March 31, 1992, when a single market determined exchange rate for the rupee was introduced, Indian exports of processed foods items have become extremely price competitive and exported items fetch attractive prices in rupee terms.

India is an attractive markets that offers foreign investors many opportunities. Many potential problems that confront foreign investors in other places are not found in India where the accounting and legal system are made simple and transparent.

For many potential foreign investors, there will not be any language barrier in India. English is the predominant business language there. Raw material are readily available and there is a lot of potential for further development of raw material resources. There is also abundant manpower as India has the third largest technical and scientific manpower in the world, after the US and the former USSR. It is easy to find skilled and unskilled labour. Besides, the costs of labour in India are much lower than the costs in developed countries. What is more, India is located strategically in the southern peninsula of the Asian continent and between the



Middle-East and South-East Asia. This makes India an ideal distribution centre for the Middle-East, South-East and Central Asian countries for products manufactured in India as well as for re-exports.

The Reserve Bank of India (RBI) is the central banking institution and supervisory body for all banking operations in India. Currently, there are 275 commercial banks in India, of which 24 are foreign banks.

All local sources of financing are available to companies that involve foreign participation or companies incorporated in India, regardless of the extent of foreign participation. There is a wide network of financial intermediaries in India that can meet the most complex financial needs of the business sector. There include an extensive network of domestic and international commercial banks, financial institutions for long term industrial finance, insurance companies, investments trusts, mutual funds, venture capital funds, leasing firms and other facilities.

**Setting up a company :** There are various ways to establish a company in the Indian markets. The first way is to incorporate a company in collaboration with an Indian partner. Another way is to incorporate a company in collaboration with an Indian partner and /or with the general Indian public. The third way is to incorporate a wholly owned company with 100 percent foreign equity. By far, the easiest and fastest option to establish a business presence in India is the acquisition of an existing company. This can be done through the transfer of shares and /or through the issue of fresh capital.

Before setting up a company in India, potential investors have

#### Incentives for EOUs and EPZ units

- \* Duty-free imports of industrial inputs
- \* 100 per cent foreign equity is encouraged in such units
- \* EOUs/EPZ units are entitled to a tax holiday. They are exempt from payment of corporate income tax for a period of five years in the first eight years of operation.
- \* Exemption from taxes on export earnings even after the period of tax holiday.
- \* Exemption from central and state sales taxes on reduction and sale.
- \* Industrial plots and standard design factories are available to EOUs/EPZ units at concessional rates.
- \* EOUs/EPZ units can raise foreign currency loans, subject to certain conditions.
- \* Supplies from the DTA to EOUs/ EPZ units are regarded as deemed exports and are, hence, exempt from the payment of excise duty, which means that high quality inputs are available at lower costs.
- \* The FOB value of export earnings of EOUs/EPZ units is allowed to be clubbed with those of parent/associate companies in the DTA for the purpose of getting Star Trading House, Trading House or Export House status which entitles units for certain benefits.
- \* EOUs/EPZ units may export goods through Star Trading Houses, Trading Houses and Export Houses.

Sources : Ministry of External Affairs, Govt. of India

to take into account the attitudes of the state government and the incentives they offer as part of the location decision. Indian state government offer foreign investors an incentive package, the details of which are dependent on the state's investment priorities.

**EOUs & EPZ units :** Units set up primarily for the purpose of manufacturing goods for exports in India enjoy many special incentives. These units can be EOUs (100 percent Exports Oriented Units) or EPZ units (Export Processing Zones Units).

#### Incentives for Exporters who are not EOUs/EPZ units

- \* Export profits are exempt from income tax in the proportion of export turnover to total turnover
- \* Duty-free import of capital goods and raw materials is allowed for export production
- \* Advance licenses are made available to exporters to enable them to avoid payment of customs duty on goods required for export production.
- \* Star Trading Houses, Trading Houses, Exports Houses are eligible for self-certified and self-declared advance licenses
- \* Special import licenses for items in the Negative List of imports are available to three categories of exporters :
  1. Deemed Exporters
  2. Star Trading Houses, Trading Houses and Export Houses
  3. Manufactures with ISO 9000 or BIS 14000 certification
- \* Higher royalty payment of 8% (net of taxes) is permitted on export sales as compared to 5% on domestic sales, in addition to export commissions of up to 10%

Source : Ministry of External Affairs, Govt. of India

EOUs may be located anywhere in the country while EPZs are designated areas within which manufacturing and processing activities are carried out only for the purpose of export. EPZs provide customs clearance facilities and basic infrastructural facilities such as developed land, standard design factory building, built-up sheds, roads and assured power and water supply. Currently, there are seven designated EPZs in India. These are Kandla in Gujarat, Santa Cruz in Bombay, Madras in Tamil Nadu, Falta in West Bengal, Cochin in Kerala, NOIDA (near New Delhi) in Uttar Pradesh and Vishakhapatnam in Andhra Pradesh. All EPZs, except the one at Santa Cruz in Bombay, are open for investment in the food processing sector.

Generally, the minimum value addition for EOUs/EPZ units has been set at 20 per cent. However, the specified minimum local value addition is 30 percent for fish and shrimp culture and feed production units. EOUs and EPZ units are permitted to sell up to 25 percent of their production in value terms in the domestic markets or specifically the domestic tariff area (DTA), if indigenous inputs used are greater than 30 percent. If indigenous inputs are less than 30 percent, then DTA sale is limited to 15 percent. However, those EOUs/EPZ units in agriculture, aquaculture, animal husbandry, floriculture, horticulture, pisciculture, poultry and sericulture can sell up to 50 percent of their output in the DTA. Furthermore, all EOUs/EPZ units can also dispose of rejects, up to a maximum of 5 percent, in the DTA.

The Indian Government also provides certain incentives for exporters in India who are not EOUs/EPZ units.

Courtesy : Asia Pacific Food Industry Jan/Feb'95



# AHARA '96

**Organised by India Trade Promotion Organisation, New Delhi**

*The 11th edition of AHARA exhibition, India's foremost event for the food, food processing and hotel and restaurant industry, is held at Pragati Maidan, New Delhi, from March 8-11, 1996.*

*Fuelled by a growing institutional market and a large middle class of 200 million, and changing lifestyles and spending patterns, as well as increasing urbanisation, the Food Processing Industries in India have registered rapid growth and is fast transforming itself into a high-tech, high volume, export-oriented industry. India's exports of processed foods are targetted to reach US \$ 1600 million in 1997 from the current level of US \$ 1000 million.*

*The almost complete delicensing of food processing industries has drawn a large chunk of Foreign Direct Investment in the last few years. Projects with an investment of US \$ 14 billion have been approved in the 1990s and these are in the various stages of implementation.*

*AHARA '96 therefore is an opportune moment to meet discerning buyers from this expanding industry.*

*With increasing foreign tourist arrivals, and a very sizeable domestic tourist traffic, the hotel room capacity, in approved category, is currently being doubled to 88,000. AHARA remains an important event on the calender of the hotel and restaurant industry.*

*A record number of over 253 companies participated in AHARA '95, 40 exhibitors among these were from Italy, Germany, Singapore, U.K., U.S.A., Finland, Hong Kong and France. The show covered a net area of 6,000 sq.mtrs and over 75,000 business visitors visited, with substantial business amounting to Rs. 1185 million accruing.*

*Due to certain delays, we at **The Amalgamated Press**, Mumbai were unable to receive the list of Exhibitors at AHARA '96 in time for publication in this Special Issue of **BEVERAGE & FOOD WORLD**. However, as always in the past many years since AHARA has held its shows, our journal has given its full support by participation, as well as serving the food and beverage industry through the pages of "**BEVERAGE & FOOD WORLD**" bi-monthly journal. BFW now enters its 23rd year of publication and reaches over 5000 marketing / technical executives in processed foods and beverage manufacturing firms including those manufacturing dairy, bakery and confectionery products, soft drinks, liquors, etc. F & B managers in hotels and catering establishments, academic & research institutions, etc.*

✍ Editor....

## THE AMALGAMATED PRESS

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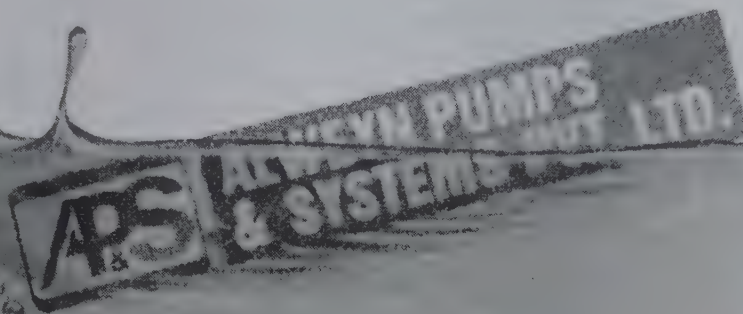
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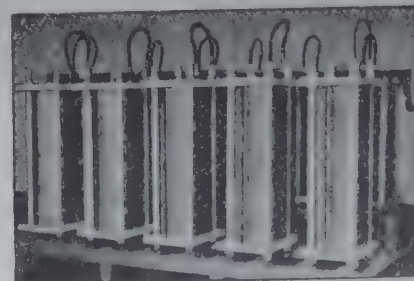
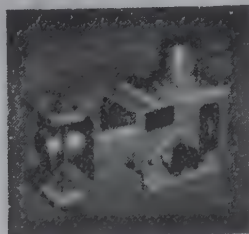
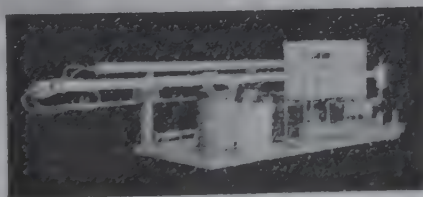
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# NEWS & NOTES

## 'BUDDHA' BEER CANNED

Monks at a Buddhist temple in east China have forced a local brewery to give up making its Buddha brand beer claiming the brew insulted their reputation and dignity.

The monks at Dafo Buddha temple in Zhejiang province, went to court to force Xinchang Brewery to stop producing its Dafo, (Buddha beer), but the dispute was settled out of court, the newspaper China Daily said.

It said the brewery agreed to pay \$600 in compensation and apologise to the monks for the "loss of face" they suffered when advertisements for the beer were aired on local TV stations.

## FAT - FREE POTATO CHIPS ON THEIR WAY

Americans will soon be eating potato chips made with the first zero-calorie artificial fat. The US Food and Drug Administration approved Procter and Gamble's olestra recently, over the protests of some scientists who called the fake fat dangerous.

The FDA warned consumers that olestra can cause gastrointestinal side effects such as diarrhoea and can literally wash out of the body certain nutrients particularly when eaten along with that lunchtime bowl of soup or pile of carrot sticks.

But the FDA concluded that while some people will find olestra unpleasant, it is safe for the general population to eat in potato chips and other snack foods as long as the food bear a label warning of those side effects.

"There are real effects in some people," says FDA commissioner David Kessler. "They may be annoying. But we do not believe they are medically significant." Procter and Gamble spent 25 years and \$250 million developing olestra, which it will put in its own Pringles potato chips and sell to other snack makers, including Frito Lay Inc., under the brand name Olean. Test marketing will begin in a few months.

"By replacing the fat in snacks, Olean

can help millions of Americans cut excess fat and move closer to achieving an important dietary health goal," said Procter and Gamble chairman John Pepper.

But consumer advocate Micheal Jacobson of the Centre for Science in the Public Interest urged Americans not to eat olestra because it depletes nutrients believed to fight diseases.

Olestra is a synthetic chemical made of sugar and vegetable oil. It looks like regular fat but its molecules are too large and tightly packed to digest.

## NORMS BENT IN AWARD OF LIQUOR LICENCES

In gross contravention of stipulated guidelines in clearance of proposals made by foreign liquor firms, the ministry of industry has given 'indirect' approval to International Distillers (India) Ltd to manufacture Indian made foreign liquor and country liquor using molasses as a raw material.

International Distillers (India) Ltd, the Indian subsidiary of International Distillers and Vintners was allowed by the ministry to set up a joint venture to manufacture Indian made foreign liquor and country liquor provided that the former did not "use molasses or molasses-based potable alcohol as a raw material". It has subsequently received a go-ahead from the ministry to utilise the licence issued to Polychem Ltd, Bombay, and use any raw material.

IDI bought into existing Indian liquor firm Polychem soon after it received clearance from the ministry to set up an Indian subsidiary and Polychem's licence was transferred to it on May 20, 1994.

IDI's proposal on an Indian joint venture cleared on May 13, 1994 and the company issued an industrial licence No. IL-16 (77) dated January 28, 1977, originally issued to Polychem Ltd, for manufacture of Indian made foreign liquor and country liquor with an installed capacity of 500 bulk kilolitres. However, the approval letter categorically stated that the go-ahead had been given "subject to the condition that you shall not use molasses or molasses-

based potable alcohol for the manufacture of any alcoholic beverage".

In a subsequent letter on May 20, 1994, the ministry of industry gives permission to International Distillers (India), transferring to the joint venture the industrial licences of Polychem Ltd and allowing it to make use of molasses or molasses based potable alcohol for the manufacture of IMFL.

## ASIA MAY BECOME SWEETS EXPORTER

Growing Asian confectionery demand would be increasingly met by local manufacturers and there was a chance the region could soon appear in export markets, an Australian industry official said.

Stuart Spencer of the Confectionery Manufacturers of Australasia (CMC) said, "...I fully expect that in a few short years, Asian-based confectionery manufacturers will challenge the lead in world export trade, particularly in sugar confectionery."

Spencer was addressing a conference on future market trends which preceded the trade fair ISM currently held in Cologne.

Although there was growth potential of breath taking proportions, the windows of opportunity for companies from industrialised nations was limited, Spencer said.

"Local business people are fast becoming attuned to the sophisticated concepts of commercial development," he said.

They would be helped by their competitive labour costs, pro-business governments, high private saving rates and high levels of foreign investments.

The region also had an abundance of raw materials.

Asia accounts for 25 per cent of the world's cocoa supply today compared with only six per cent.

Spencer said those wishing to trade within the region should bear in mind the religious, cultural and social diversity.



## APRICOT OIL HOLDS GOOD EXPORT VALUE

Little known apricot oil, hitherto untapped on a large scale, had tremendous export potential if processed commercially, according to a renowned Oil-seeds, Research Institute.

Grown in the hills of Himachal Pradesh, apricot contained oil with rich medicinal and commercial value, according to Gian Singh, Director of the VMA Oilseeds Research and Development Institute (VORDI). The Kalpa Valley in Kinnur district in that State alone produced apricot oil worth Rs. 1,000 crore at international prices, he added.

Urging the vegetable oil industry to process apricot oil commercially to meet the demands of international and domestic markets, Singh said that the oil was widely used in ayurveda, siddha unani and other medicines in drugless therapy as well as in cosmetics and other pharmaceutical preparations.

With this objective in mind, the institute has proposed to the Union Agriculture Ministry to undertake a detailed survey of the Kalpa Valley to assess and further develop the potential of the rich oil, he said.

Locally known as "Chulli", apricot originated from China and Central Asia, Singh said.

An apricot tree, Singh pointed out, could produce 1.2 tonnes of oil per hectare, which was equivalent to the yields from mustard and rapeseed, and the local people used this oil for cooking as well as for hair and body massage.

It was estimated that Kinnur district alone accounted for more than 50 per cent of Chulli plantation while the rest was scattered over other districts of the State.

In Uttarakhand, the estimated area under cultivation was about 7,500 hectares in the hills, while in Kashmir and Ladakh region, it was cultivated in about 2,000 hectares.

In Ladakh region, the State Government has launched special schemes to hike apricot production—about 715 hectares with 2.94 lakh plants were under apricot cultivation at present, he said.

Meanwhile, the Centre has permitted liberal import of edible oil which could be used either as a raw material for vanaspati manufacture or for direct consumption. Estimated import in the last eight months was six lakh tonnes, valued at Rs. 1,200 crore.

To check the country's dependence on import and the flow of foreign exchange, measures were being taken to augment domestic production of vegetable oils, according to leading traders in the edible oil industry.

The country has so far tapped the vast potential of non-conventional oils to a very limited extent only. Considering the negligible cost of surveying the feasibility of exploiting apricot oil potential, the benefits that would accrue were immense, industry experts said.

## AUSTRALIANS SWAP FISH AND CHIPS FOR ASIAN FOOD

Australians prefer the spicy fare of Asian fast food over traditional fish and chips as their favoured takeaway dish, a study released recently showed, underscoring the nation's steady integration with Asia.

The study, by financial consultants BIS Shrapnel, found that the proportion of Australians who regularly eat Chinese and other Asian fast food climbed to 51 per cent in 1995 from 41 per cent in 1992.

Those turning to fish and chips for a quick meal fell to 48 per cent in 1995 from 59 per cent in 1992, according to the study, titled "Fast Food in Australia 1995-1997" which was based on interviews with 1,500 consumers late last year.

"The fish and chip shops, which are mostly family run, still exist and still are doing very well, but in relation to the popularity and revenue growth of the others, they haven't kept up with the pace, BIS Shrapnel's Sandro Mangosi said.

Mangosi, BIS's food industry specialist who conducted the survey, said the growing popularity of Asian fast food also reflected a jump in the number of Asian takeaway food outlets and a willingness among Australians to try something different.

The research fits snugly with a concerted push by Australian Prime Minister Paul Keating to integrate Australian business with the Asian region and lure more Asian businesses into Australian industries such as food and tourism services.

Despite the popularity of Asian takeaway shops, western sandwiches, chips and hamburgers rated as the three most popular takeaway products last year, the study said.

They were followed by cakes, filled rolls, pizzas and doughnuts. Meats pies, long an icon of Australia's fast-food diet, ranked eight followed by fried or grilled fish and barbecue chicken, the report said.

McDonald's, the global fast food group, remains the nation's favourite takeaway restaurant, followed by Kentucky Fried Chicken and Pizza Hut, BIS said.

## JAPANESE SWAP COCOA FOR TEA ON HEALTH GROUND

Japanese are ditching tea for cocoa, leaving supermarket shelves nearly empty after buying sprees triggered by media reports saying cocoa is good for the health.

"Sales of cocoa have rocketed after a television show said how healthy cocoa was," said, Masahisa Uchino, director-general of the Chocolate and Cocoa Association of Japan.

Since December, the media have reported several findings, announced at a symposium on cocoa and chocolate nutrition in Tokyo last year, which say cocoa helps reduce cholesterol, and protects teeth from cavities and the stomach from pains.

Cocoa's transformation from a calorie-loading beverage to a wholesome drink has fanned buying by health-conscious housewives, industry sources said.

Retail giant Daiei Inc said cocoa sales in January tripled compared with the same month one year ago.

Kataoka and Co. Ltd., import agent for Holland's Van Houten cocoa, said it had been forced to fly in cocoa in an effort to meet surging demand. It is normally shipped by sea.

Top domestic cocoa makers Morinaga and Co. Ltd. and Meiji Seika Kaisha Ltd said they have been producing cocoa around the clock, but are still unable to meet the demand.

"We're making as much cocoa as possible, but are still overwhelmed with orders", a Meiji spokesman said.

Both companies issued newspaper apologies in January to consumers unable to buy cocoa, and have halted television commercials because of the shortage.

Uchino said domestic cocoa output could double from normal levels of 2,500 tonnes a year.

Traders said imports could climb to 9,000 tonnes from about 6,000 tonnes. Japan's cocoa market is still relatively small with annual consumption of about 20 cups per person in 1992, according to the Chocolate and Cocoa Association.

This compares with the Dutch, who drink 387 cups per person a year. Austrians at 363 cups and Australians at 237 cups, according to association data.



# COMPANY NEWS

## COCA COLA INDIA

Coca-Cola India, which reportedly enjoys 65 per cent of the carbonated soft drinks market in the country at the moment, is awaiting the Union government's clearance to substantially enhance its market share.

The global soft drinks giant has submitted a \$ 700 million plan to the centre for increasing its activities exclusively in the soft drinks sector, according to a spokesman of Coca-Cola India in Calcutta recently.

Coca Cola India has inaugurated India's first can-vending machine in Calcutta - the host city of the opening ceremony of the Wills World Cup 1996. The launch of the can vending machine closely follows the successful market launch of Coca-Cola and Fanta in 330 ml cans in Bombay, Calcutta, Delhi and Madras. Each of the machines stores upto 30 cans at a time.

Also launched is a unique drinks trolley, specially designed for the Wills World Cup 1996. The 18ft highweight glass drinks trolley is in the shape of the World famous 'Coca-Cola Contour Bottle' mounted at a 30° angle on a steel chassis on wheels with an entrance built at the bottom of the bottle. The trolley can accommodate 2 to 3 helpers complete with soft drinks, ice bjns, fresh water, lighting, seat bench and all amenities required by the cricket players during the drinks intermission. The trolley has a single serving hatch from which the "Real Thing" will be served to the players on the field. The overall width of the trolley is 5 ½ ft and its height from the ground is 8 ½ ft.

Coca-Cola India set a landmark in the soft drink consumer market in India by introducing the universal favourites Coca-Cola and Fanta in 1.5 litre 'PET' bottles.

The light weight PET launched is manufactured from the most superior quality plastic and has been specially designed to withstand high temperatures to suit Indian climatic conditions. The Georgia green coloured Coca-Cola PET and the crystal clear Fanta PET bottles carry "image enhanced graphics" on them. The bottle is made from a single piece mould having a

"Pettaloid shaped" bottom which makes it sturdy and keeps it well balanced. The PET bottles will come in a corrugated packing of 12 bottles a case, specially packed to deal with all-terrain transportation.

## ABC FARMS

The milk and milk by-product manufacturer, ABC Farms, is planning to tap the capital market in mid-1996 to fund its expansion according to Sohrab Chinoy, the proprietor. Chinoy's ABC Farms is probably the country's only speciality cheese manufacturer, handling a capacity of 10,000 litres of milk a day at present. He plans to increase this capacity to 75,000 litres a day, the licence for which is expected to be issued soon. Besides his own cattle, Chinoy also purchases milk from other suppliers since his own output is not enough for the manufacturing requirement. The total size of the expansion is expected to be worth Rs. 30 crore. While Chinoy was reluctant to reveal the exact stake he would hold post-issue, it would be a controlling one. He pointed out that several foreign companies had shown interest in his scheme but they could not agree on the controlling interest.

ABC Farms posted a turnover of Rs. 1.2 crore in 1994-95 and this is expected to rise to Rs. 1.5 crore in 1995-96. Chinoy is confident that the company would be able to make a 'good start' after the expansion and public issue, by mid - 1997. Also on the anvil, is a cold store and bulk storage facilities at his present location. The company, which manufactures speciality cheese for niche markets in all metros, also supplies to five star hotels and pizzerias in Bombay. ABC Farms is in the process of setting up franchisee outlets in Madhya Pradesh and Tamil Nadu, having set up in Goa in October, 1995.

## MYSORE BREWERIES

Mysore Breweries Ltd (MBL) is in an expansion, diversification mode. The company is diversifying into the manufacture of mineral waster. Simultaneously, its subsidiary company Pals Distrilleries has obtained a letter of intent to set up a brewery at Aurangabad in Maharashtra.

The Aurangabad brewery will have a capacity of 50,000 hectolitres and will be commissioned at a total cost of Rs. 18 crore said Mr. K.P. Balasubramaniam, vice chairman and managing director, MBL.

MBL will manufacture beer brands such as Knock Out, Cobra, Pals among others at this brewery. The brewery will go on stream in the first week of October 1996. Construction work has already commenced in Aurangabad and the erection work will begin in April.

Mysore Breweries is launching 'Stream' brand of mineral water in the market, shortly. Stream will initially be available in Karnataka and Andhra Pradesh. Within the next six months, the product will be launched in neighbouring markets like Tamil Nadu. The product will be available in one litre bottles and 500 ML bottles.

This Rs 1 crore project spread over a five acre plot centres around a natural spring at the Kunigal hills near Bangalore. MBL's mineral water factory will be inaugurated on 22 February.

The company has decided to get into the manufacture of mineral water because it is a growing market, says Mr. Balasubramaniam. The market is expected to rise from six million cases in 1994 to over ten million cases in 1996.

MBL has also recently diversified into the manufacture of garment exports to Europe and processed foods to USA.

The company, which is celebrating its silver jubilee year, has drawn up a plan to increase its turnover from the current Rs. 35 crore to Rs. 100 crore, in the next couple of years.

## PRAJ INDUSTRIES

Praj Industries Ltd of Pune is setting up a complete distillery plant for Pelwatte Sugar Company of Buttla in south Sri Lanka. Praj bagged this order amidst stiff international competition from Chinese and German companies.

Sri Lanka, with one of the largest per capita consumption of potable liquor, has been importing alcohol for further processing. The imports of alcohol works out to \$



4 million.

With the setting up of the 30,000 litres per day distillery, Sri Lanka will be saving on import cost and adding to its exports by way of refined spirit. Initially, Pelwate will concentrate on exporting the alcohol in bulk and follow it up with further processing. Currently, Sri Lanka is exporting 25,000 tonnes of molasses.

### BRILLIANT BOTTLERS

Brilliant Bottlers India Ltd (BBIL) of Madras, an off-shot of the local soft drink Kalimark, has been appointed as the franchisee of Cadbury Schweppes Beverage India Ltd (CSBIL) for bottling their soft drink.

Announcing this at a press conference in Madras recently to mark the launch of their soft drink Crush in the city, Ashok Jain, vice president and country head, Beverages, CSBIL said that BBIL will be manufacturing the soft drink under the guidance and as per the quality standards of Cadbury Schweppes.

Also present at the conference were John Bird, managing director, India and Africa division of CSBIL and Shankar, senior official of BBIL. In his short speech, Bird detailed the operation of CSBIL worldwide.

Aiming to capture a chunk of the Rs. 750-crore non-cola soft drink market, Jain informed that products have already established a market share of 6 per cent and in another two years would go up to 10 per cent. Moreover, he added that another six brands from the product basket will be introduced in the next six months.

CSBIL has embarked on a massive advertisement blitz and it has already put up 100 holdings and advertising in over 100 cinemas in the city for the Crush launch. Besides creating more awareness for the

product, this media hype is also expected to take the battles to the doorstep of other soft drink multi-national giants in the times to come. Cadbury Schweppes is already battling the likes of Coca-Cola, Pepsi in the marketing arena in over 180 countries, thereby aggregating a turnover in excess of Rs. 20,000 crore, he pointed.

Added to the flavour of 'Crush' is the three colour crates being presented to retailers besides various distributor schemes. CBSIL has also tied up with Raj TV for telecasting a sponsored programme consisting of film songs.

### AGRISYSTEMS

Agrisystems Equipments B.V. of the Netherlands, an engineering advisory company, which builds mushroom farms all over the world, is entering the Indian mushroom market. The Dutch company will hold an equity stake in the proposed company in addition to a full buy back arrangement, Steve Taylor manager, commercial, Agrisystems told newsmen in Pune.

The 100 per cent export oriented unit (EOU) to be set up at village Bedse, near Pune, for the cultivation, processing and canning of white button mushrooms, is promoted by Cryptogen Agro Industries Ltd. (CAIL).

Khare said they had a technical and financial tie-up with the Dutch company for a full buy back arrangement. In addition, the Dutch partner will hold 19.18 per cent equity in the venture which is scheduled to begin commercial production by June 1996. Khare added that they had for the first time, included a "yield warranty" clause. By the terms of this clause, the Indian promoters were guaranteed a minimum yield from every production cycle for the full duration of the five year agreement, failing which a penal clause would be activated

and the Dutch partner would have to pay 0.50 per cent of the total project cost per week as damages.

Another unique feature of the agreement was that the Indian partner could terminate the buy-back agreement after giving a month's notice. This was a one-way arrangement only, which the Dutch partner could not enforce, Khare said. This would allow CAIL to realise the best price for its produce, either in the domestic or international markets. Taylor said this was the first Indian venture for the Dutch company, adding that they would go in for more such collaborative efforts shortly. They have already identified another partner, close to the CAIL location, in Maval taluka, Pune district, he added.

Taylor clarified that this was the first time the Dutch company had entered into an agreement where they would hold a stake in the venture or would buy back the mushrooms. He said this was done keeping in mind "the Indian culture which desires the partner to be involved with a financial stake and a buy back arrangement." He added that this involvement of the foreign partner helped in the public issue as well.

The proposed mushroom growing facility would produce 1920 tpa of fresh mushrooms, which would amount to 1340 tpa after blanching and processing.

### ENKAY TEXOFOOD

Enkay Texofood Industries engaged in the business of export of fruits, texturised yarns and a range of bulk commodities and consumer products, has embarked upon a major expansion plan that will cost it Rs. 300 crore.

Encouraged by the success in the export of fruits, the company plans to invest another Rs. 100 crore in the industry over a period of two years, said Murli Goyal, managing director, Enkay Texofood Industries.



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tries.

"The food processing industry has a lot of untapped potential which our company desires to explore," he said adding that the company might even consider entering the manufacture of food products in future.

However, Goyal said the company currently was in the process of strengthening its business of export of fruits for which Enkay recently received the export house status.

President of the food processing division of the company, Jayant Dixit disclosed that the company was in the process of acquiring food processing units in the country.

Enkay has drawn plans to expand its operations towards South.

"This again depends upon a lot of factors including availability of water but in the meantime we want to concentrate on managing the supply of foods," said Dixit.

The company harbours plans to increase the production of fruits by ten times in the next two years from the existing capacity of 30,000 tonnes of food purees and concentrates per annum.

At present, the food processing division of the company is operating on two separate lines of processing. "One processing line deals exclusively with Banana and other is meant for other seasonal fruits like pineapple, mango, guava and papaya", Dixit added.

Enkay is the first company in Asia to produce natural banana puree, he added. The company has technical-cum-financial collaboration with the Thyssen group, the third largest corporate house in Germany.

The company is pursuing the strategy for export-driven growth for which marketing offices are being opened outside India, he added.

The company which already has marketing offices at Netherlands and Russia plans to open offices in North America, Japan and Dubai within one year.

In the international market, Enkay's clientele comprises of Pepsicola of US, Coca-Cola, Belgium, Heinz, United Kingdom, Nestle, France and Procter & Gamble, Germany.

According to Dixit, the company is holding talks with the Indian subsidiary of these giants for possible supply of raw fruits.

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#### KR FOODS

KR Foods Ltd, an existing profit making company, is coming out with a public issue of Rs 3.2 crore to part finance the

expansion project for the manufacture of vanaspati ghee and backward integration project.

The company has an installed capacity of 9900 million tonnes per annum of vanaspati ghee. After the expansion, the company's installed capacity will increase to 19800 mtpa. The company is also planning to go in for backward integration for the manufacture of vanaspati through distillation - cum-deacidification.

The company has a requirement of 1076 kva. To insulate itself from the ills of irregular power supply, the company has made provision for two 500 kva DG sets.

Vanaspati Ghee is one of the most important cooking mediums being used in the country, besides refined oil and vegetable oils. The company's well-established brand, 'Swad', faces competition in the UP markets from bigger players like Suraj Vanaspati and Amrit Vanspati Ltd.

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#### ENERGY PRODUCTS

Incorporated in July 1995, Energy Products plans to produce corn chips and other corn-based eatables. The company is going public with a 2.46-crore issue, at par, to part finance the project cost of Rs 5.02 crore and meet the cost of marketing the product.

The company, though managed by experienced promoters, is their maiden venture. The company has purchased second-hand plant and machinery. The concept of corn chips is new to India and it would require concerted effort to markets the product.

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#### SM DYECHEM

In a major re-orientation move, the Rs 400 crore SM Dyecchem group has decided to accord priority to its five-year old food division. The group is all set to launch a host of new products in the coming months.

The food division of the company SM Foods, which currently markets 'Peppy', 'Piknik', 'Minerale' water and the 'Vital' brand of refined Soyabean oil also harbour plans to launch atleast 4 to 6 new products every year.

To begin with, the company will very shortly launch its 'Vital' brand of refined Soyabean oil in the western region, "The launch of 'Vital' which has a strong presence in North India, is expected to make us the market leaders in the total refined oil sector in the country," said P K Gokhale, Head, SM Foods.

As regards the snacks section of the SM Foods, Gokhale says that the company would be introducing at least four new

products in the market in the next 2 to 3 months. To supplement the growth process for its snacks section and reduce the distribution cost, the company will be opting for the 'multiple-location sourcing' strategy. Gokhale said the company is scouting for an Indian partner for entering into a manufacturing tie-up for this purpose.

"Essentially, we are looking for associates who specializes in the types of snacks available in their respective regions," he said while adding that after selecting the partner, recommendations will be made in the recipe in keeping with the high quality standards of the company.

To increase its combined sales from the current Rs 150 crore, the company is also in the process of repositioning some of its products while simultaneously sprucing up its brands through product-line-extensions.

The company is also attempting to break into new audience by introducing new flavours for the adult consumer. "Traditionally, our target audience has been the children. But, now we will be widening our audience base," said Gokhale.

The company's new flavours under its 'Peppy' brand namely the 'Ringos', 'Peppy' Cheese balls and the "Peppy" tomato 'n' spice have already been launched with the aim to attract the adult consumers.

SM Foods, the market leaders in the snack's markets, had also launched mineral water in under its 'Peppy' brand, some six months back. The company is also contemplating to introduce new flavours in the range for the first time in the country.

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#### DHRUV MAKHAN

Dhruv Makhan (India) Ltd (DMIL), incorporated in 1994, is setting up a dairy plant with an installed capacity of 9,900 ltrs per day for manufacturing value-added dairy products like pasteurised milk, flavoured milk, ghee, casein, butter, cheese and khoa, for which the company is going public.

The company has been promoted by Navin R Thakkar and Shailesh R Thakkar, who have some experience in the field. This is their first manufacturing venture. For marketing purposes, the company will have arrangement with small retailers, hotels and restaurants in Gujarat and Bombay. The company is also negotiating with private truck operators for the transport of milk to the plant and the distribution of the products. Since milk and its products are perishable, efficiency in transportation is very important. The company will have to face competition from existing players like Amul, Vadilal, Gokul, Gayatri, Royal and Uttam.



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# EXPORT HIGHLIGHTS

## GRAPE

In 1995-96, exports of grapes are estimated to touch 25,000 tonnes valued at Rs. 50 crore against 18,000 tonnes valued at Rs. 42 crore in 1994-95. This shows that exports are definitely on the rise.

The rise in exports has been gradual and the present level achieved is based on the performance in the past five years. However, the increase was more apparent after the Agriculture and Processed Food Products Export Development Authority (APEDA) had imported 'Refrigerated Container Technology' from Europe in 1991-92.

## RICE

Rice exports in the current financial year (1995-96) are likely to touch 25 lakh tonne as compared to just 2,000 tonne last year.

The Food Corporation of India (FCI) has already sold 25,000 tonne of fine and superfine rice for export, according to an official news release. An additional 10 lakh tonne is likely to be sold till March, it says.

To ensure improvement in the quality of foodgrains and to maintain their uniformity in the Central pool, single grade specifications for paddy and rice have been fixed for the whole country since the kharif 1995-96.

India, flush with foodgrains stocks, is emerging as the world's second largest exporter of rice and is pushing up wheat sales.

"India was the sixth largest exporter of rice till 1994/95 (April/March). In 1995/96, we are emerging as the second largest after Thailand. We have displaced the United States, Vietnam and China," said D.B. Sabharwal, secretary of the Agricultural and Processed Food Products Export Development Authority (APEDA). Sabharwal said production shortfalls in Vietnam, Thailand and the United States and a drought in Bangladesh were the main reasons for the rapid rise in exports.

Indian long grain rice was finding new markets in Indonesia, the Philippines,

Morocco and Bangladesh but exports could fall back from 1995/96 highs.

Sabharwal said apart from rice, India was focusing on its wheat exports. Wheat exports in 1995/96 would be between 700,000 to 800,000 tonnes, though the APEDA had licensed exports of 1.2 million tonnes.

Sabharwal said the APEDA expected wheat exports in 1996/97 (April-March) to reach about 2.0 million tonnes, though poor transport and shipping facilities were hampering shipment.

## COFFEE

The Country's coffee export earnings for the financial year of 1995-96 could cross the Rs. 1,100 crore mark for the first time according to official sources.

While exports for 1994-95 generated earnings of Rs. 1,096.08 crore, that was against an exchange-rate of about Rs. 31.25 for a dollar. However, coffee did well enough in 1994-95 to overtake tea as India's principal foreign-exchange earning commodity by earning \$ 350.19 million.

The anticipated export earnings of over Rs. 1,100 crore for 1995-96 is based on an exchange-rate of about Rs. 35 to the dollar. By this yardstick, the final figure for 1995-96 is expected to be about \$ 340 million.

The target set for 1995-96 had been 1,50,000 tonnes in quantum and about \$ 375 million in terms of value.

The Coffee Board has estimated that 1,00,754.64 tonnes have been exported between April 1, 1995, and January 15, 1996. This is estimated to have generated export earnings to the tune of about \$ 280 million.

With shipment permits issued for another 30,000 tonnes, the board expects earnings for the complete financial year to be above \$ 340 million.

## SUGAR

India has exported 200,000 tonnes of sugar out of the 500,000 tonnes which the Government had authorised the industry in October to export, Food Secretary, Arun

Sinha, said.

Food Minister, Ajit Singh, said that only 80,000 tonnes had been exported by that date, despite sales contracts for slightly more than 500,000 tonnes, because of transport and other infrastructure problems.

"The sugar industry says they have tied up for nearly 500,000 tonnes of exports," Sinha said in a telephone interview. "The actual (physical) export has been 200,000 tonnes."

## PROCESSED FRUIT/VEGETABLE

Returns from export of processed fruits and vegetables have trebled from Rs. 1.03 billion to Rs. 3.1 billion in the last four years and experts forecast a 30 per cent annual rise till 2000 AD, if nothing goes wrong with the rate at which agro-industries are growing and the investments they are attracting.

As many as 3,101 industrial entrepreneurial memoranda involving an investment of Rs. 391 billion (\$ 11.17 billion) and proposals worth Rs. 76.8 billion (\$ 2.16 billion) involving foreign investment and technology agreements for agro-based units have been approved, according to a study by Federation Chambers of Commerce and Industry (FICCI).

The food processing industry alone has already received \$ 83 million by way of foreign investments in the last four years, sources at Agricultural and Processed Food Products Export Development Authority (APEDA) say.

With foreign capital and technology inflows the sector is expected to see a lot of growth as is seen by the performance of few that have sprouted over the last decade.

The total installed capacity of fruits and vegetable processing industries is expected to increase to two million tonnes by 1996-97, according to FICCI.

The country's food processing industry ranks fifth in size, employs 1.5 million workers and produces 13.5 per cent of the total industrial output with 5.2 per cent of the total industrial investment.



# EXPORT OPPORTUNITIES

## ARGENTINA

Food team SRL, Sanchez de Bustamante 1278, 4 to 'A' 1137, Buenos Aires. Tel/Fax: 9640707. Wish to import Kitchenware and Cutlery.

## GERMANY

Famos GmbH., Im Gewerbegebiet 6, D-57368 Lennestadt-Elspe. Tel: (02721) 92580. Fax: 925849, are looking for Bakeries/Confectioneries: Icing Bag (Fast to Boiling) 100.000, 150.000 or 200.000 pcs.; Dough Scraper with wooden handle 50.000 or 100.000 pcs. All parts must be O.K. for the German Food Statute.

## GUYANA

M.M. Kem Majeed International, P.O. Box 10800, 87, Barrack Street, Kingston, Georgetown, Guyana. Fax: 5922-54084. Importers of Sunflower Oils.

## INDONESIA

Duta Novindo Sarana Pt., Intercon Plaza Block F. No. 9, Jl. Meruya Ilir Raya, Jakarta 11650. Tel: 62-21-5346229/5857435, Fax: 62-21-5853304. Importers of Food Products, Commodities, Household Goods.

## KUWAIT

Ashian Gulf Est., P.O. Box 51523 Riqqa 53456. Tel/Fax: (965) 3924574. Importers of all kinds of Foodstuff, Confectionery, Packaging Materials, Building Materials, Food Processing Machines, Potato Deep Frying/Filling/Cutting and Packaging Machines.

## MAURITIUS

Patel Mag. Patel, 42, Joseph Riviere Street, Port Louis. Tel/Fax: 230-464-2366. Importers of Consumer Goods, Foodstuffs.

## NEW ZEALAND

Ajendra Prasad, Exim Marketing Int'l, 66 Rajkot Tce., Broadmeadows, Wellington. Imports: Beans, Peas, Milk Powder, Oats, Wheat, Barley.

## SAUDI ARABIA

Ram Goel, C/o Saudi Aramco, P.O. Box 6540, Dhahran 31311, Importers of Perumal Rice, Industrial Minerals & Chemicals.

Saeed Abdalla Basurra Est., P.O. Box No. 22131, Jeddah 21495. Importers of Sandalwood, Spices.

## SOUTH AFRICA

Rycham Enterprises, P.O. Box 14854, Kenwyn 7790, Tel: 27-21-6972180, Fax: 27-21-6963933. Importers of Essential Oils, Herbs, Medicinal Herbs, Natural Herbal Preparations.

Venus Int'l, Box 9083, Johannesburg 2000, Gayteng. Importers of Spices, Sugar, Herbs.

## PAKISTAN

Ebrahim Haji Zakeria, P.O. Box No. 4121, Daryalal Street, Jodia Bazar, Karachi 74000. Tel: 2441866/2425666. Gram: BESTPAK, Tlx: 21961. PCOKR PK, Fax: (92-21) 2423529. Importers of a wide range of raw materials and other ingredients to certain industries including specially food processing, beverages, pharmaceuticals, cosmetics, icecream, chocolate, sugar confectionery.

## SRI LANKA

Nodimah Enterprises, No. 238/1A Kotie Road, Nugegoda. Tel: 821800. Fax: 0094(1) 821 800. Importers of Aluminium Collapsible Tubes, ROPP (Roll-on-Pilfer-Proof) Caps, Form-Fill-Seal-Weigh Machines for Liquids Oil.

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# TRADE FAIRS & EXHIBITIONS

## FOODEX INDIA '96

**Venue :** Rotterdam, Holland

**Date :** April 24-27, 1996

Fresh & Processed Fruits & Vegetables, Cereals & Preparations, Indian Snacks, Spices, Health Food, Tea, Coffee, Marine Products, Animal Products are some of the exhibits that will be on display at Foodex India '96. The exhibition is sponsored by Ministry of Food Processing Industries, and will be an excellent platform for exporters to Europe to promote their products.

*For details, write to:*

India International Marketing Centre, K-7, Green Park Extension, New Delhi 110016. Tel: 6968615/6862504. Fax: 011-6867571.

## FOOD & HOTEL ASIA '96

**Venue :** Singapore

**Date :** April 16-19

The 10th Asian International Exhibition of Food & Drink, Hotel, Restaurant & Catering Equipment, Supplies & Services and Conference with the 10th FHA International Salon Culinaire will feature Food & Drinks, Food & Restaurant Equipment, Hotel Supplies & Services.

*For more details, contact:*

Star C. Yoder, Public Relations Manager, Singapore Exhibition Services Pte. Ltd. Singapore 0922. Fax: +653395651 or Orbit, 1127 Midway Premises, A. S. Marathe Marg, Prabhadevi, Bombay 400 025, Fax: 22-430-5707.

## THE 1996 FMI INTERNATIONAL SUPERMARKET INDUSTRY CONVENTION AND EDUCATIONAL EXPOSITION

**Venue :** Chicago, Illinois, USA

**Date :** 5-8 May 1996

From equipment and suppliers to perishables, grocery products and information systems - there is something for everyone. a dynamic exhibit floor highlights the industry's biggest names, as well as smaller companies featuring new and one of a kind products and services.

In addition, the U.S. Food Export Show is sponsored by the National Association of Agricultural and the

U.S. Department of Agriculture's Foreign Agricultural Service, features another 400 companies displaying uniquely American food products not found at other trade fairs.

*For further information, contact :*

**Food Marketing Institute, 800 Connecticut Avenue, N.W., Washington, DC 20006-2701 Tel: +1-202-452-8444 Fax: +1-202-429-4559.**

## METPACK '96

**Venue :** Essen, Germany

**Date :** 7 - 11 May, 1996

Metpack '96 - the world's premier show for the metal packaging industry has already received overwhelming support from both existing and prospective exhibitors.

Metpack '96 will coincide with Interpack in Dusseldorf - the prestigious general packaging trade fair - on three consecutive days (May 9, 10 and 11).

A close working relationship between the organisers of both exhibitions guarantees many benefits for those wishing to visit either event. One example of this is a direct shuttle between Essen and Dusseldorf which takes less than 20 minutes.

*For further information contact :*

**Daniel O' Mahoney or Tony Bradley, Bradley O' Mahoney Public Relations. Tel: +44 (191) 281 8833. Fax: +44 (191) 281 4954.**

## INTERPACK '96

**Venue :** Dusseldorf, Germany

**Date :** 09 - 15 May, 1996

The global top transposition event in the world of packaging that is Interpack the 14th international fair of packaging machinery, is back after three years, bringing in great international demand.

It is not only the biggest happening in the world for its industry, but also the most important communication forum. The fair is an opportunity for consumers, suppliers and decision makers from top management from all over the world to meet, exchange ideas and to discuss the current issues affecting every sphere of packaging industry.

**Exhibit Profile:** Interpack nomenclature

covers no machinery or plants for the manufacture, finishing or imprinting of packaging material but packaging machinery in the strict sense. It includes 200 items for packaging machinery. That mainly touches the sectors like : • Food and luxury food industry • Pharmaceutical and cosmetic industry • Chemical industry • Confectionery industry • Biscuits industry • Drinks industry

Changing economic and technological trends of global significance are highlighted at the fair. In short, the tendency of future packaging markets and spurring development of technological innovations are projected at "Interpack".

A special group visit is organised by ORBIT for the benefit of packaging experts.

*For more details contact :*

**ORBIT, 1127 Midway Premises, A.S. Marathe Marg, Prabhadevi, Bombay 400 025. Tel: 4379282/83 Fax: 4305705.**

## 12TH FISPAL INTERNATIONAL FOOD FAIR

**Venue :** Sao Paulo, Brazil

**Date :** June 11-14, 1996

The exhibits at this Exhibition will highlight Food, Beverages, Packaging Machinery, among others.

*For further details, contact:*

**Luis F. Olivaira, Brazil Rio Promocoos Ltd., Avenida EMG Luis Carlos Barrini 1178, Sao Paulo, SP, Brazil. Fax: +55(11) 5054158.**

## IMEGA '96

**Venue :** Munich, Germany

**Date :** September 21-25 1996.

Imega '96 the 4th International Trade Fair for the Restaurant and Catering industries and for the Food Trade, will have Fast food and Snacks as one of the themes of special interest.

Imega '96 offers the soft drinks industry an ideal platform for contact with partners from restaurant and catering industries and the trade in these countries.

*For details, contact:*

**Messe Munchen GmbH, Messegelände, D-80325, Munchen. Tel: (089) 5107-0, Telefax (089) 5107-506.**



# BOOK REVIEWS

**QUALITY CONTROL FOR FOODS AND AGRICULTURAL PRODUCTS** Ed. by Multon, J. L. Published by VCH, Pappellallee 3, D-69469 Weinheim, Bundesrepublik Deutschland, F.D.R. Tel: +49(0)62 01/6060. Fax: +49(0)62 01/60 23 28. 1995. Ca 350 pages. Hardcover. Price: DM 198.00.

This volume provides an overview of the tools for quality control in the food industry: practical metrology, sampling methods for quality control, measurement devices, sensors, computer analysis, data interpretation, reference materials, and standardization.

It is intended to provide food companies and research centers with a single, practical reference to the wide variety of techniques for quality control in the production of food.

The complete 4- volume set offers researchers in the food and pharmaceutical industries a complete source of technical information for answering important questions on; when and how to conduct an analysis of a specific product; how to interpret the resulting data; how to define the risks associated with the introduction of a new product

Each volume includes a bibliography for further reading.

**FATS AND OILS**, First title in New Handbook series by Clyde E. Stauffer. Published by Steven C. Nelson, Publisher, Eagan Press U.S.A. Tel . (612) 454-7250, Fax (612) 454-0766

*Fats and Oils* is the first title in the new Eagan Press Handbook Series. Combining a user-friendly format with expert guidance, handbooks in this series will meet the needs of professionals in many areas of the food industry. Focusing on an ingredient or application, each title brings together essential information that is currently unavailable in a single, accessible guide. Plans for future titles in this series include handbooks on enzymes, sweeteners, hydrocolloids, colorants, and dairy-based ingredients.

The current volume presents the basics about fats and oils as well as practical advice on their uses in foods from salad

dressings to baked products. To make technical topics accessible to a broader audience, *Fats and Oils* features clearly written text filled with many easy-to-use tables and illustrations. For quick reference, definitions of key terms appear in the margin of pages throughout the text and in the book's extensive glossary.

In *Fats and Oils*, Clyde Stauffer shares the expertise that he has gained from many years of working in the food industry. Drawing on his professional know-how, Stauffer has created troubleshooting guides that make this book a powerful problem-solving tool for a wide range of industry professionals, including :

- New product developers
- Suppliers and technical sales representatives
- Quality assurance personnel
- Managers
- Teachers
- Purchasing agents
- Production personnel
- Engineers
- Chemicals

The troubleshooting guides provide quick, convenient solutions to common application problems, including these examples :

- Excessive fat pickup
- Cracks in confectionery coatings
- Soapy flavour
- Sugar bloom
- Product discoloration
- Tearing of dough
- Poor appearance of dough
- Foaming of fat
- Emulsion breakdown in mayonnaise

Describing fats and oils in various products and processes, this handbook fills in the gaps between scientific literature and the product-specific information provided by suppliers. The result is a volume that food industry professionals gain a common understanding of fats and oils, their properties, and their application. Designed as a multipurpose general reference and cross-training manual, *Fats and Oils* includes :

- Description of how fats and oils function, as ingredients
- Guidance on matching ingredients specifications to processing parameters
- Explanation of product specifications and analytical tests
- Regulatory issues
- Production and processing considerations
- Non-technical language and easy-to-use tables and graphs

Clydes E. Stauffer has been a consultant to the food industry since 1982. Before consulting, he was director of research and development at the Kroger Company Baking Division and research chemist at Procter and Gamble Company.

**ASEPTIC PROCESSING AND PACKAGING OF PARTICULATE FOODS** edited by E.M.A. Willhoft. Published by CTI Publication Inc. 2619 Maryland Avenue, Baltimore, MD 21218-4547 USA. 320 pages, 1993, Hardbound. Price : \$ 125.00 Outside USA via Air mail

New and successful technologies developed for processing and packaging particulates, as well as requirements brought about by consumer demand. The technologies include microwave processing, ohmic heating, and fraction-specific thermal processing. Only those processes, either through controlled cooking or specific pasteurization of the food product prior to sealing in sterilized packs, are considered under the term, 'aseptic processing.'

Developments in processing, dispensing and packaging machinery are covered, as well as properties and functions of packaging materials and criteria for selection.

**Contents :** Aseptic processing and packaging of food particulates • The market for aseptic products, processing and packaging and packaging systems • Packaging materials : their properties and criteria of selection • Ohmic heating • The ERCA neutral aseptic system • Microwave processing and packaging integration • The Dole process • Microbiological aspects of aseptic processing and packaging • Aseptic packaging of liquid foods • Index.

**BEVERAGES** A. Varnam, Southern Biological, United Kingdom, and J. Sutherland Institute of Food Research, United Kingdom, Published by CTI Publications Inc. 2619 Maryland Avenue, Baltimore, MD 21218-4547 USA. 464 pages, 1994, Softbound, Price : \$ 72.00 Outside USA via Air mail

Beverages provides thorough and integrated coverage in a user-friendly way. It is an invaluable learning and teaching aid and is also of great use to the food industry and regulatory personnel

**Contents :** Introduction Spring Water and other Natural Waters, Fruit Juices and Nectars, Squashes, Cordials and Carbonates, Tea, Coffee, Cocoa and Drinking Chocolate. Also included : Alcoholic Beverages, as well as Nutritive, Fortified and Special Purpose Beverages. 70 lines illustrations.



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- ★ Prevention of Food Adulteration Act.

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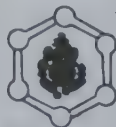
★ Squashes ★ Barley Water ★ Brewed Ginger Beer ★ Tomato & Other Sauces  
★ Crushes ★ Jam, Marmalade ★ Sweetened Mineral Water & Ready to Serve Beverages  
★ Tomato Puree & Paste ★ Fruit Syrups ★ Fruit Jelly ★ Pickles & Chutney from  
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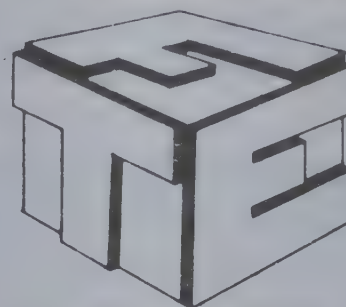
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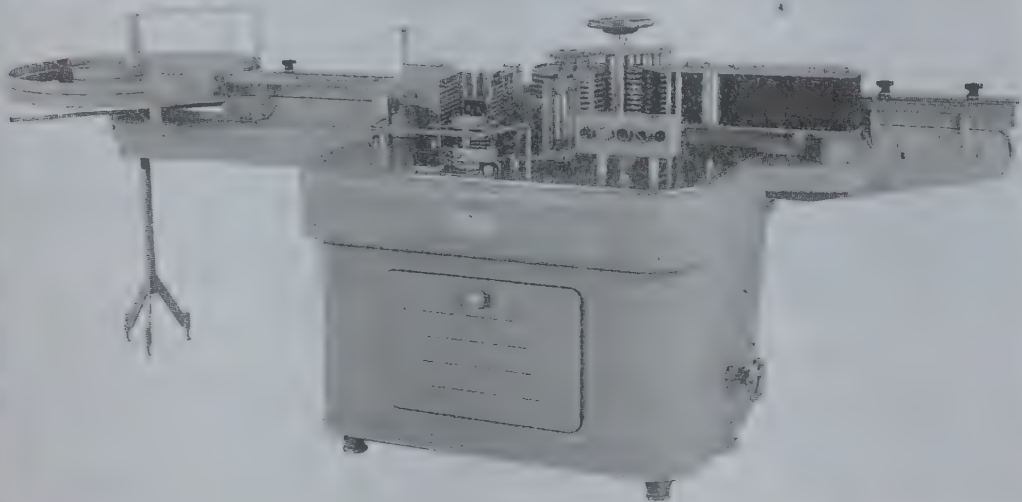
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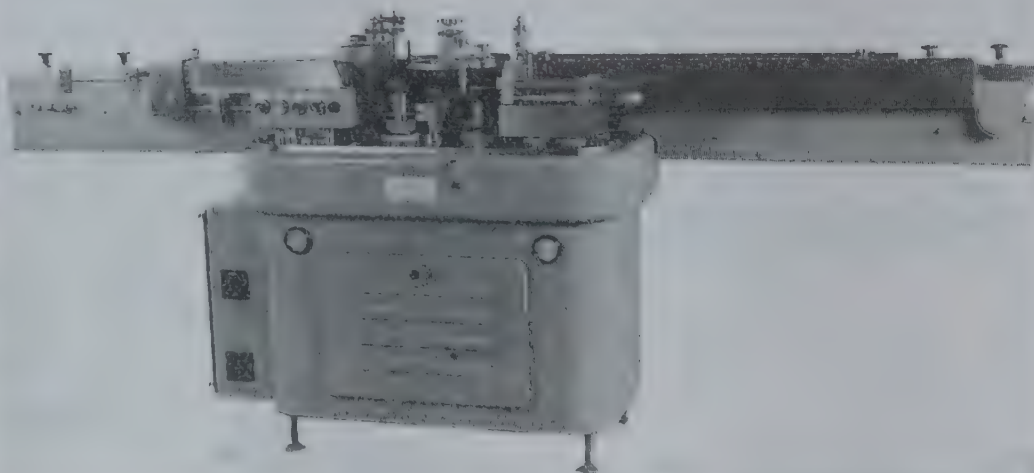
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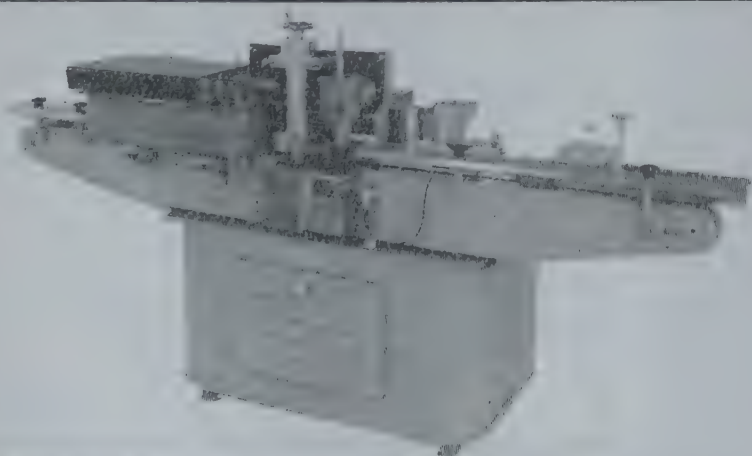
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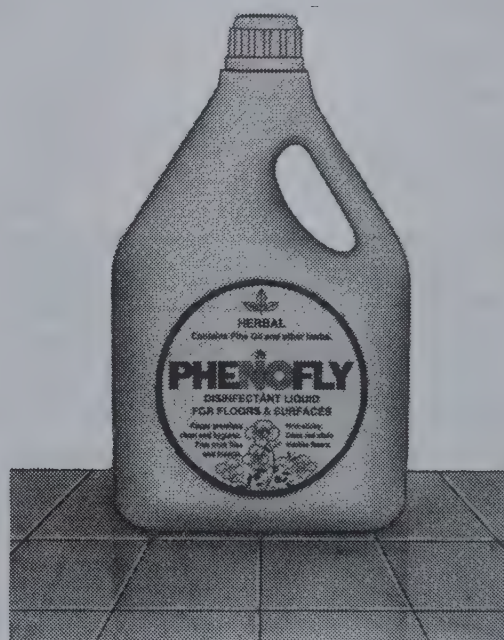
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RIECO, an Engineering Organisation employs 300 qualified & skilled staff with a sales turnover of Rs. 200 million. The Head Office is at Pune. The works is located at Roha, district Raigad, Maharashtra and is equipped with modern machinery.

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Intensivfilter GmbH & Co. KG, Germany for Air Pollution Control Equipments required for high temperature applications; S+S Metal suchgerate and Recycling technik GmbH., Germany for Metal detector/separator

**Size Reduction Equipment** consists of Crusher, Bantam Hammer Mill, Hammer Mill "Mikro-Pulveriser", Universal Mill, Air Classifying Mill, Product Collection Systems to be used with above Machines.

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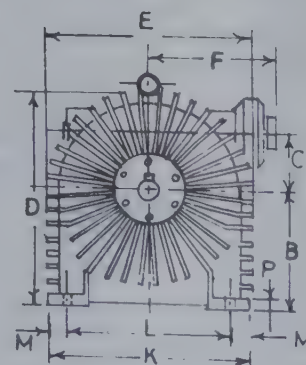
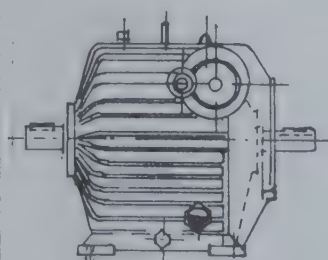
RIECO has established customer oriented test facilities to establish design parameters for pulverising of various materials, dust collection system and Pneumatic Conveying Systems. The testing laboratory is equipped with sophisticated measuring equipments. RIECO has access to a vast databank received from collaborators. Its Research & Laboratory is recognised by Council of Scientific and Industrial Research.

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## KITCHEN FOIL

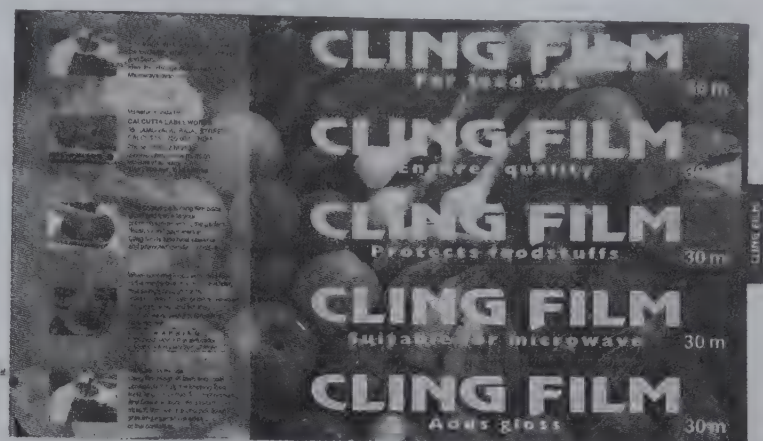
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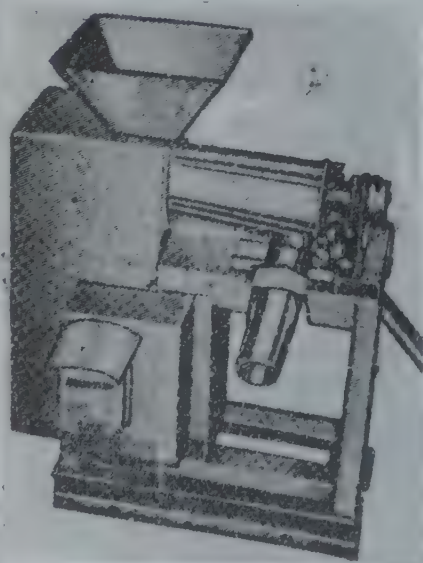
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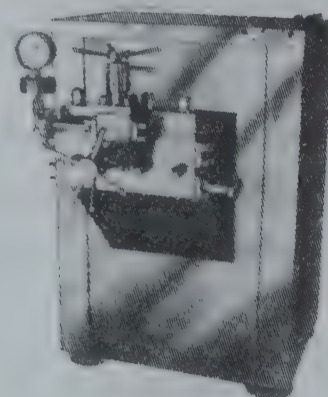
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11-B, Petwalla Compound, 244, Maulana Azad Road (North), Opp. Urdu Times, Near Nagpada Junction, Bombay - 400 008.

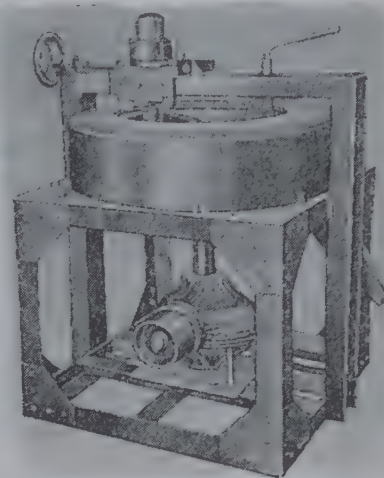
## POHA MACHINES & ROASTERS

- \* POHA (CHURA/RICE FLAKE) MACHINES
- \* ROASTERS - ELECTRIC & CONTINUOUS TYPES FOR PADDY, NUT, GRAIN ROASTING.
- \* DE-STONER
- \* SHAKER (VIBRATOR)

QUALITY PRODUCTS OVER 40 YEARS

## DURAI INDUSTRIAL WORKS

1143, METTUPALAYAM ROAD, COIMBATORE 641 043, TAMIL NADU, INDIA  
Phone: 91-0422-442380, 444409 • Fax: 91-0422-442250



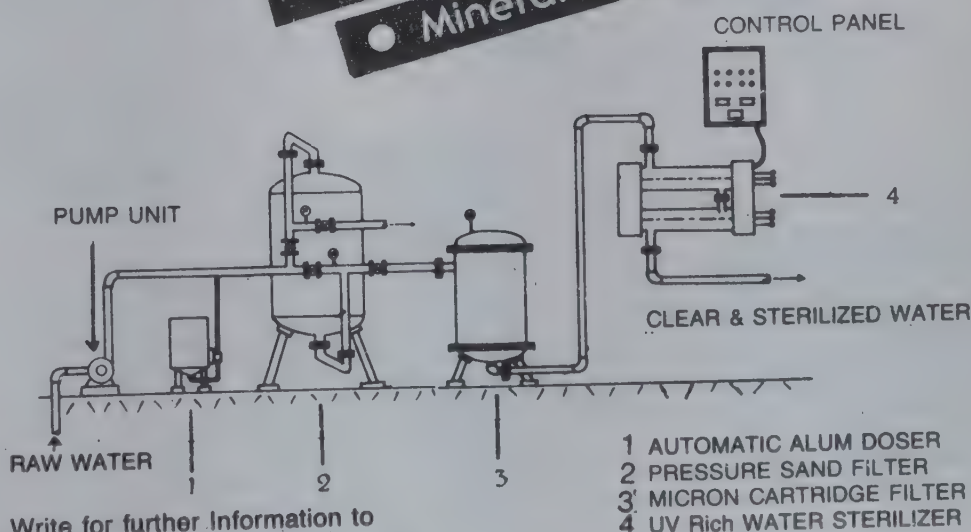
# Attention

- Food / Fish / Meat Processing Units
- Pharmaceutical Industries
- Hotels & Restaurants
- Beverages / Soft Drinks Units
- Mineral Water Plants

MICRON offers World's Latest & Specialized Water Purification & Treatment Systems, to convert fresh, brackish or saline water from river, lake, borewell or sea from their natural highly turbid & contaminated state into crystal clear, germ-free state, ideally suitable for above applications.

Based on Ultra-violet principle & so no use of harmful & toxic chemicals made.

Available in various capacities from 500 to 50,000 Litres Per Hour.



**MICRON**  
WATER TREATMENTS

F-4, Shri Kumar Hsg. Society, Nehru Road, Santacruz (E), Bombay-400 055. India  
Ph.: 6120039

Wanikar



It can homogenise fluids like milk, ice cream, juice and all kinds of emulsion due to high pressure operations. The product becomes more easy to digest, absorb, smooth, stable and homogenous which gives more value addition to the product.

The Company has developed World Class Technology with the help of National Dairy Development Board. Some of their valued clients among others are Maharashtra Government Milk Scheme, Parle Beverages Ltd., Pepsi Cadbury (I) Ltd., Raymonds, Shivamrut Dairy, Dukes, etc.

*For more details, contact:*

**Goma Engineering Pvt. Ltd.**

Majiwada, Behind Universal Petrol Pump,

Thane - 400 601 (Bombay).

Tel : 5340875 / 6436 / 1937 / 6121

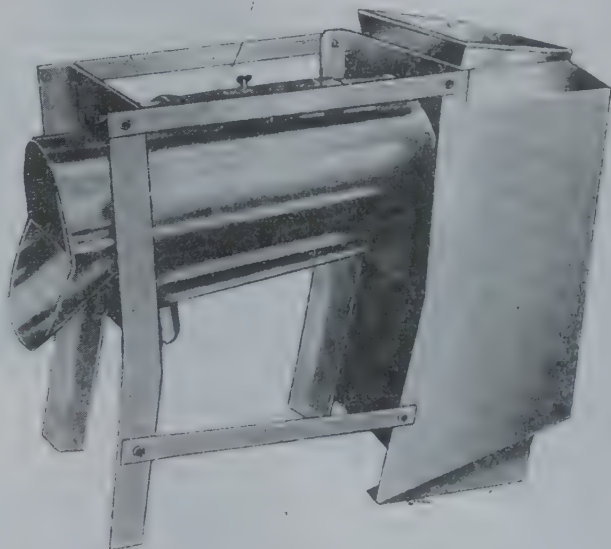
Fax No. : 0091-22-5333634

Tlx : 011-72389 TCWE IIN

## FOOD PROCESSING EQUIPMENT

Techno Equipments manufacture a range of food processing equipment such as Pulper, Pulper-cum-Finisher, Fruit Crusher, Juice Extractor, etc. as well as other equipment such as Bottle filler, Steam Jacketted Kettles, Conveyor Belt, Crown Corking Machines etc.

Their super model pulper shown below has a capacity of 1 to 1½ ton per hour inclined type and comes complete with two sieves and 5 H.P. motor while their junior model pulper has a capacity of ½ ton per hour with a 2 H.P. motor.



*For more details, contact :*

**Techno Equipments,**

31, Parekh Street, Saraswati Sadan,

Bombay - 400 004

Tel : 3851258, 5515640

Gram : FOOD EQUIP, Bombay -4

## ULTRA VIOLET WATER DISINFECTOR

Komal UVK Series provide a compact design and economical Ultra Violet treatment for water application for a wide range of applications in Mineral Water manufacturing, Pharmaceutical, Drinking water, etc.

Komal manufacture UV Disinfector which has very high radiating U.V. Lamps which emits the killer U.V. wavelength 253.7nm. In its unique feature lamps are isolated from water by

placing them inside specially fused quartz glass sleeves which emits 95% of the incident UV radiation. UVK Series of UV Disinfector having Dosage more than 30 micro sec/cm<sup>2</sup> can kill micro organisms most reliably.

Komal Disinfector asks for very little maintenance. It is provided with add-on accessories to help monitor and optimise its performance. UV Disinfectors are available in various models having flow rate ranging from 500 lits/hr, 800 lits/hr, 2000 lits/hr, 5000 lits/hr. in stainless steel construction.



*For more details contact:*

**Komal Industries,**

307, Goradia House,

104, Kazi Sayed Street,

Bombay 400 003.

Tel : 344 6561/3447304

Fax : 91-022-3446561.

## STIRRERS

Fibre & Fibre Products are manufacturers of Stirrer, Mixers, Homogenisers, Agitators, Flocculators, Aerators, Emulsifiers and Clarifiers. These products find application in water & effluent treatment, adhesives, food & beverages, pharmaceuticals, chemicals, cosmetics, paints, dyes, etc.

*For your requirements, contact :*

**Fibre & Fibre Products**

D-8/10 Jalnidhi

Bangur Nagar, Goregaon (W)

Bombay 400 090

Tel : 872 5510

Fax : 872 7455.

## ALGINATES / GUMS

Kelco's alginates are derived from algin, the polysaccharide extracted from brown sea weeds harvested along the coast of North and South America, New Zealand and Africa. Kelco's processing and manufacturing plants are located in San Diego, California, Girvan and Barcaldine in Scotland. Kelco's alginates are world class highly standard products. These are refined industrial and gelling grades sodium alginates, refined ammonium, refined potassium and propylene glycols alginates. Kelco also manufacture alginic acids, specially alginates and dairy stabilizers. The alginates are available in low, medium



and high viscosity grades. They are used as thickeners, gelling agents, emulsifying agents, stabilizing agents, water holding agents and disintegrants in food, textile, paper, explosives, ceramics, pharmaceutical and various other industries. They are sold under various trade names such as, Manutex, Manugel, Superloids, Kelmar, Dariloids, Manucol, Kelacids, etc.

Xanthan gum are produced by aerobic submerged fermentation and are identical to the polysaccharide formed by the bacterium *Xanthomonas campestris*. Selected Kelco xanthan gums are used in the overseas market for confectionery, dairy products like ice creams, sherbets, sour creams etc., desserts like puddings, mousses, etc. bakery goods, pie fillings, flavoured emulsions, beverages, frozen fruits, dry mixes, dietetic foods (as a partial replacement for starch), sauces, toppings etc. They are sold under the trade names of Kelzans (industrial grade) and Keltrols (food grade).

*For your requirements, contact:*

**Burzin & Leons Agenturen Pvt. Ltd.**  
 Readymoney Building No.1,  
 Sir Ratan Tata Marg  
 Bombay 400 034  
 Tel : 4944616, 4921255  
 Tel/Fax : 4930283

## ULTRAVIOLET SYSTEMS

Hitech Ultra Violet systems eliminate oxides and other contaminants in ultra pure water by using only Teflon and PVC as parts which contact water. The excellent ultra transmission characteristics of Teflon contains a higher ultra violet field which results in a better kill of micro organisms.

A special water flow pattern through the Teflon tube assures turbulence and full exposures to the ultra violet rays. High turbulence and non wetting characteristics of Teflon eliminate any built-up of contaminants that could block ultra violet rays. Hence no wiper of chemical additives system are necessary. Separation of fluid circuitry from electrical circuitry allows the lamps to operate continuously even without water. This also allow the ultra violet lamps to operate at their optimum operation temperature so they can produce optimum ultra violet light.

Hitech Ultraviolet also manufacture TOC (Total Organic Carbon) reduction Sterilizers which oxides organics into carbon dioxide gas.

Application: Aquaculture, Beverage Industries, Breweries, Dairies, Water Bottlers, R.O.Systems, Wash Water for Food products such as vegetables, fruit, fish etc. Toxic Chemical Distribution, etc. Pharmaceuticals and Cosmetics Industries, Hospitals, Laboratories, etc.

Hitech Ultraviolet manufactures Sterilisers in various capacities depending on the flow rate required by each application and maximum capacity of 12 lac. L.P.H.

*For more details, write to :*

**Hitech Ultraviolet,**  
 P.B. 8356, 35 Grace Plaza,  
 S.V. Road,  
 Jogeshwari (West)  
 Bombay 400 102  
 Tel : 6244327, 6704610/11  
 Fax : 6244337

## PECTINS

Vidarbha Fruit Products Pvt. Ltd. now manufacture International Standard Pectins at its highly sophisticated modern plant.

The product range comprise Citrus pectins, Lime Oil, Processed Lime products such as juice concentrate, squash, cordial, etc.

*For your requirements, contact:*

**Vidarbha Fruit Products Pvt. Ltd.**  
 B/1 Rajdarshan Basement -B  
 Opp. Rly. Platform No. 1,  
 Thane (W), 400 602.  
 Tel : (022) 5404782  
 Fact: (07234) 27049.

## INSECTOCUTOR

Flies and Flying insects are more than a nuisance: they can be a major threat. So, when it comes to flying insect control, you just can't take chances.

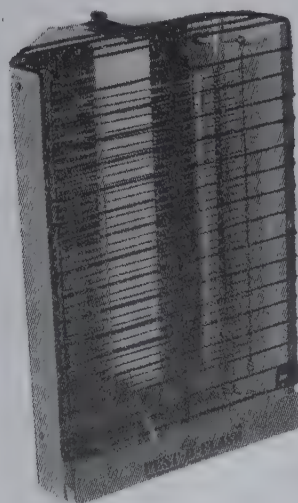
Welcome to Pest Control India Ltd. makers of PEST-O-FLASH - the flying insect control system relied upon by multinationals, large Indian corporations and public sector units, among others.

Benefit from the unmatched expertise of PCI - India's premier company. PCI - the pioneers and leaders in pest control.

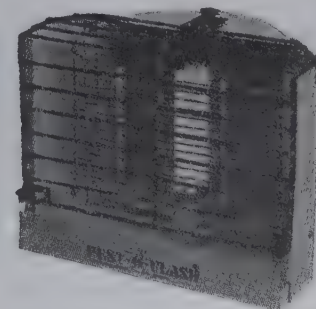
PEST-O-FLASH flying insect control system is widely used throughout the country in hotels, restaurants, canteens, dairies, bottling plants, pharmaceutical companies, bakeries, food processing and canning industry, fisheries, abattoirs, wherever flying insect control is important.

The Pest-O-Flash flying insect control system is a proven approach to killing flies: conveniently and hygienically. Kills flies continuously without interrupting production, customer traffic or any activity; is low priced and noiseless; the running costs are very low, like using a tube light at home, and is so economical; absolutely safe, with plastic coated M.S. guards provided. Above all there are no fumes, no chemicals, no odours.

The system comes in various models to suit different needs of customers. Below are shown 2 models:



Corner Model (CF 36)



Corner Model (CM 9)



Other models are High-line ceiling model (HLC) and Low-line model (LL).

*For your requirements, contact:*

**Pest Control (India) PCI Limited**

Marketing Division:

127, Keytuo Ind. Estate,

220, Kondivita Road, Andheri (E)

Bombay 400 059.

Tel : 821 7385, 821 3546, 821 3547

Fax: 822 1647

**CARAMEL COLOUR**

Sayaji Sethness Ltd. - a joint venture company promoted by Sayaji Industries Ltd. (Ahmedabad) and Sethness Products Co. (USA) manufacture Caramel Colours ranging from delicate yellow to the darkest browns, used for improving taste and appearance to foods and beverages.

Over a century from 1880 the company have developed and standardized the manufacturing process to obtain a product that meets the highest standards.

The Caramel Colour finds application in dark breads, cookies, cake mixes, gravy & gravy bases, soy sauce, condiments, cocoa/chocolate, candy/liquorice, cereals, soups and a range of other products.

*For your requirements, contact:*

**Sayaji Sethness Ltd.**

17/18 GVMM, Odhav,

Ahmedabad 382 410.

Tel : (079) 875100

Fax : (079) 871338.

**BISCUIT/BREAD BAKING OVENS**

Aifso's continuous converised type automatic direct & indirect gas and oil fired Ovens are of most modern design in respect of fuel consumption and uniform baking/drying quality. These ovens are supplied all over India and abroad to reputed companies like Parle's, Britannia's, Bakemans, and the metal decorating and barrel Drying Ovens to Companies like Poysha, Balmer Lawrie, Larsen & Toubro among others.

*For further details, contact:*

**Aifso Enterprises**

A/I, Vena Beena Apts., Sewri (West)

Bombay 400 015.

Tel : 413 09 26, 413 73 39, 413 71 09

Fax : 91-22-413 73 39.

**FLAVOURED TEA**

Fantasy Flavoured Tea comes from the house of Sapat, who are well established in the tea business since 1897. Today we are one of the largest regional tea company with over 300 employees and one of the few tea companies in India with an inhouse food science department with professionals from India and the United States involved in development of blends and flavours. We also have our own Quality control department which performs statistical quality control tests on all products which ensures that all products comply with all local and international quality standards.

Now, for the first time in India we have introduced yet another revolutionary product: FANTASY Flavoured Tea.

Fantasy Flavoured tea is an amalgam of high quality tea and ALL NATURAL ingredients like fruits, herbs, spices and flavours to conjure an exotic sensory experience of distinctive yet subtle aromas, flavours and colours. Presently we have introduced three flavours: Masala, Chocolate and Rose in the Indian market. These flavours have been developed through extensive surveys and research to suit the Indian taste and style of preparation.

We have launched the Tea in Maharashtra, and according to initial reports, the brand has tasted early success. In Pune, where it was first launched in the institutional market, reports indicate that more and more people are enquiring about fantasy flavoured tea. Soon, the tea is all set to be launched in other areas and presently market survey is underway for the introduction of exciting new flavours like Strawberry, Orange Spice, Apple Cinnamon, Earl grey and others.

*For further details, please contact:*

**Sapat Packaging Industry Ltd.**

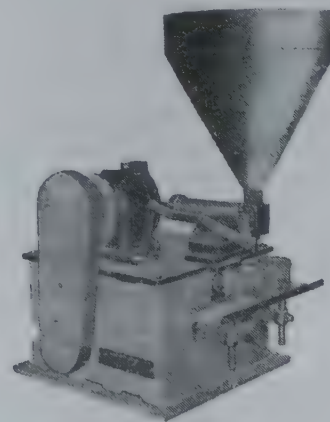
1362/K, Ram Bhuvan, Old Agra Road

Nasik 422 002

Tel : 576188, 573283. Fax: (91) 0253-576011

**POSITIVE DISPLACEMENT PISTON FILLER**

Among the Filling Machines manufactured by Bombay Engineering Industries is the Automatic Liquid Filling Machine, shown below which is used to fill liquids and pastes. The machine is automatic with a high speed, extreme accuracy. It accepts any container and is simple to operate. It works independently of human error and fatigue. Models come in LF/PF/100 (5 to 100 ml), LF/PF/200 (10 to 200 ml), and LF/PF/500 (20 to 500 ml).



*For your requirements, contact:*

**Bombay Engineering Industry,**

R.No. 6 (Extn), Sevantibai Bhavan,

Chimatpada, Marol Naka,

Andheri (E), Mumbai 400 059.

Tel : 836 9368.

**COCONUT CREAM**

Introducing Frescho Canned Coconut cream. 100% pure, it retains all the vitamins and proteins nature has invested in coconuts. So easy and convenient to use, it will make all your dishes turn into the most exotic recipes. And does it last! while homemade coconut milk does not stay fresh more than 6 hours,



Frescho has a shelf life of 1 1/2 years. Ideal for pastries, curries, payasam, kheer, appam, sweets, beverages, cocktails and much more, it is a blessing to bulk users like confectioneries, bakers, manufacturers of icecream and ayurveda, catering establishments, cosmetics and health products.

Frescho Coconut Cream is available in 200 ml. Tins and has an unopened shelf life of 18 months. If opened it can be stored in fridge for further use. No preservatives are used and it is 100% pure coconut cream. It is a ready to use, conveniently packed nutritious and hygienic product, processed and canned by modern technology, untouched by human hands.

*For your requirements, contact:*

**Fresh Coconut Products Ltd.**

Kadupissery, Kerala 680 698

Ph: 048886-7863, 407. Fax: 048886-7863

Bombay Office:

1st Floor, House No. 87, Jess Born Villa,

Kalina Village, Bombay 400 029.

Tel : 022-6171343. Fax: 022-6183160.

### FILTER HOUSINGS / CARTRIDGES

In years past, the pureness of our water was taken for granted. We no longer have that privilege.

The most obvious need is for removal of suspended solids from water. Filtration is the process of passing water through a porous, fibrous medium such as paper, cloth or synthetic membrane to remove the suspended particles.

Ametek, Inc is a Fortune 500 global manufacturing company with its headquarters in USA. The company makes high quality, technology based products. Plymouth Product division, a part of Ametek's Industrial materials group handles housings and filters for water and other fluids in such Commercial/Industrial applications as Food Preparation and Beverage Vending.

The Ametek filtration range includes PP Fibre cartridges, PP Wound cartridges, Pleated cartridges, Cellulose Resin Bonded cartridges, Carbon cartridges in lengths of 5", 10" and 20" with nominal micro rating of .2 to 50 microns. Furthermore, for cartridges used in Food, Beverages and Pharma Industry, materials which meet FDA specifications are used making it safe for such applications.

The cartridges are compatible for used with standard housings of other makes.

Ametek also offers a variety of filter housings to choose from with flow rates ranging from 2000 to 9000 LPH.

*For more details, contact :*

**Ace Marketing Company**

222, Shah & Nahar (A2)

Lower Parel, Bombay - 400 013

Tel : 494 4942, 494 5957

Fax : 91-22-4954250

### MINI-PULVERIZERS

D.P. Pulveriser works has introduced mini-pulverizers for grinding of wet (pulpy) and dry material, Spices, e.g. chillis, turmeric, coriander, pepper, cloves, cinnamon, cardamon, asafoetida, nutmeg, etc. can be ground in the mini pulverizer to suit your requirements, as well as fresh ginger, garlic, green chilles, etc. The pulverizers find application for custard powders, broken

biscuits, roller dried skimmed milk powder, sugar, iodized salt, all types of pulses and can do the job as finishers for fruit pulp.

*For further details contact :*

**D.P. Pulverizer Works,**

Modi & Modi Bldg. No. 2,

76 Nagindas Master Rd.,

Bombay 400 023.

Tel : 2676435/2674901

### CONFECTIONERY

Rose Garden Confectionaries is promoted by very experienced people in this field.

Presently the company is manufacturing premium quality, hard-boiled Candies and Toffees in various flavours. The Company has started its marketing to entire U.P. and Eastern India. Among important buyers are Indian Airlines Ltd., East-West Airlines, Jet Airways etc. and various prestigious institutions in the country.

Rose Garden intends to export its products and simultaneously increase its net-work in all states in India.

*For further enquiries and requirements, contact:*

**Rose Garden Confectioneries Pvt. Ltd.**

216, City Centre, The Mall,

Kanpur-208004.

Tel: 310867, 354386. Fax: 0512-310867.

### CULINARY HERBS

Herbs add a gourmet touch to plain cooking and have a wide variety of uses. For example, the Basil leaf is used in soups, omelettes, cottage cheese, fish sauces, stuffings, meat and vegetable preparations. So also Chives (stems) added to soups, omelettes, cottage cheese, hamburger sauces, vegetables, salads, give a delicate onion flavour. The sweet spicy flavour of Marjoram leaves and the versatile Parsley leaf enhance the flavours of stuffings in Duck and Turkey roasts, besides being used in marinades, stews, etc.

Sage, Rosemary, Thyme are used in tea as infusions, and impart their own unique flavours to pork, lamb, stews, besides enhancing vegetables, salads, cheese and egg dishes and soups. The Oregano leaf is specially used in Pizzas and Pastas, and also in Broccoli and Mushroom dishes. Italian, Mexican and Spanish preparations use this herb lavishly. Mint (Pepper & Spear), either ground or chopped is used for Kabab dressings, in salads and in sauces and chutneys. Celery stalk is very popular in Chinese cooking, while the leaves are used in Salads.

Herbs are natural flavourings, enjoyed specially by the diet conscious as they are calory-free. A *bouquet garni* - an aromatic bundle of herbs made from thyme, parsley, marjoram, gives variety to vegetarian cooking.

Herbs are used by housewives, hoteliers and caterers. All these herbs are now available in India from Rupande Food Products.

*For your requirements, contact:*

**Rupande Food Products**

52 Shivajinagar, N.M. Joshi Marg

Lower Parel (E), Mumbai 400 013

Tel : 306 0357



## SEPARATION MACHINERY

Goldin (India) Equipment Pvt. Ltd., a Baroda based company is engaged in manufacturing of American design high tech modern Separation Machineries for Processing industries like Oilseeds, Seeds, Spices, Grains etc.

Goldin manufacture Gravity Separator both Pressure type as well as vacuum type which is widely used in Grains/Seeds/Spices industries to remove damaged, broken seeds from whole seeds for better germination and export quality products.

Goldin Impact Huller/Hull Separator is used for dehulling of Oilseeds like Sunflower, Safflower, Neem seeds, Palm Kernels, Coffee, cherry etc. Goldin offer complete system for cleaning, destoning, hulling and hulls separation including material handling and electricals. Many plants on turnkey basis have been completed and running successfully.

*Write for details:*

**Goldin (India) Equipment Pvt. Ltd.**

1st Floor, Saraswati Industrial Estate

Opp. Chhani Jakat Naka

Vadodara 390 002.

Tel : (0265) 481 452, 480 449

Fax: (0265) 481 452, 480 449

## SEMI-AUTOMATIC LABELLING MACHINES

Bhavani Sales Corporation introduce for the first time in India, semi-automatic Labelling Machines for all types of round containers, jars, cans, tins and bottles.

Special Characteristics: For metal, glass, plastic, composite containers/bottles; works with cold glue; for face and wrap-around labelling; easy transportable, labelling any size without changing parts; output is 30 containers/per minute.

*For more requirements, contact:*

**Bhavani Sales Corporation,**

Plot No. 2/1 Phase II, GIDC

Vatwa,

Ahmedabad 382 445

Tel : 5831346

Fax: 079 5835885

## CANTEEN DINING TABLE



Elma manufacture canteen dining table in 94" (L) x 34" (W) x 30" (H) size. The top is covered by 16-gauge SS 304 sheet and

polished. Seats, 8 or 6 in SS top, are suspended and slide under the top frame. Supported on four galvanised pipe legs, the floor will be open to cleaning after services, once the seats are moved in. This space-saving model is used in large industrial canteens. Heavyduty construction with MS channels and pipe frames offer long life, says the firm.

*For further information, contact:*

**Elma Industries**

A-15 Aaram Society,

Vakola, Santacruz (E),

Bombay 400 055.

Tel : 6129315

## CHEMICAL PLANT & EQUIPMENT

Adam Fabriwerk Pvt. Ltd. are designers, manufacturers and erectors of Plant and Equipment for Chemicals, Pharmaceuticals, Fertilizers and Drug intermediates.

The company offers product range comprising Ointment and cream plant, fluid bed driers, reaction kettles, storage tanks, silos, heat exchangers, crystallizers, blenders in ribbon, paddle, cone and cylindrical shape, agitators, and standard stirrers, custom built fermentors and extractors, etc.

All fabricated equipment are tailormade under various codes such as IS, BS, ASME, DIN STANDARD.

*For further details, contact:*

**Adam Fabriwerk Pvt. Ltd.**

203 Rajguru Apts.,

New Nagardas Road,

Andheri (E).

Bombay 400069

Tel: 8380548, 8384173

Fax: 91-22-8390195

## MILK SHAKE MACHINE

100% indigenously manufactured with the state-of-art technology in combination with components from Indian & Foreign reputed brands, the machine has a unique design to ensure easy operation, with a sturdy and high quality body material for durability.

Spare parts are easily available at any hardware shop in case of breakdown of machine. All the functions like production, cleaning, overnight storage are available.

*Contact for details:*

**A & R Corporation**

107, Rajshree Indl. Area,

Chitalsar Manpada,

Ghodbunder Road,

Thane 400 007.

Fax: 0091-22-5335188.

*When replying to Ads.*

*Please mention*

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GUM ARABIC, GUM ACACIA, GUM GUAR  
GUM KARAYA, GUM TRAGACANTH  
GUM GHATTI, GUM ESTER  
(All above GUMS are FOOD GRADE)  
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(Food Grade)

SODIUM ALGINATE - (Food Grade)

GUM XANTHAN - (Food Grade)

GUM CARRAGENAN - (Food Grade)

LOCUST BEAN GUM - (Food Grade)

\*\*\*\*\*

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**STABILISER / THICKENER / BINDER  
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3. Bread Improvers for Bakery Products
4. A very Special Quality product for Melted Cheese, Cheese Spreads, Soft Cheese
5. For Jams & Jellies, RTS Beverages ... And many other food applications....

FOR LITERATURE & SAMPLES ON GUM ALGEL - PLEASE CONTACT

**ALOK CHEM CORPORATION**

406, Goradia House, P.O. Box No. 13048,  
100/104, Kazi Sayed Street, Bombay 400 003.

Tel Office: 3426390/3415668/3425365

Res: 5648355/6238090. Grams: "GUMSAGAR"

Tele Fax : 91-22-3415668

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BOMBAY - 400 027 (INDIA)

PHONES : SHOP : 3077388, 3089781

FAX : +91-22-3089781

**GRIP ENGINEERS PACKAGING MACHINES  
VERTICLE FORM/FILL/SEAL MACHINE**



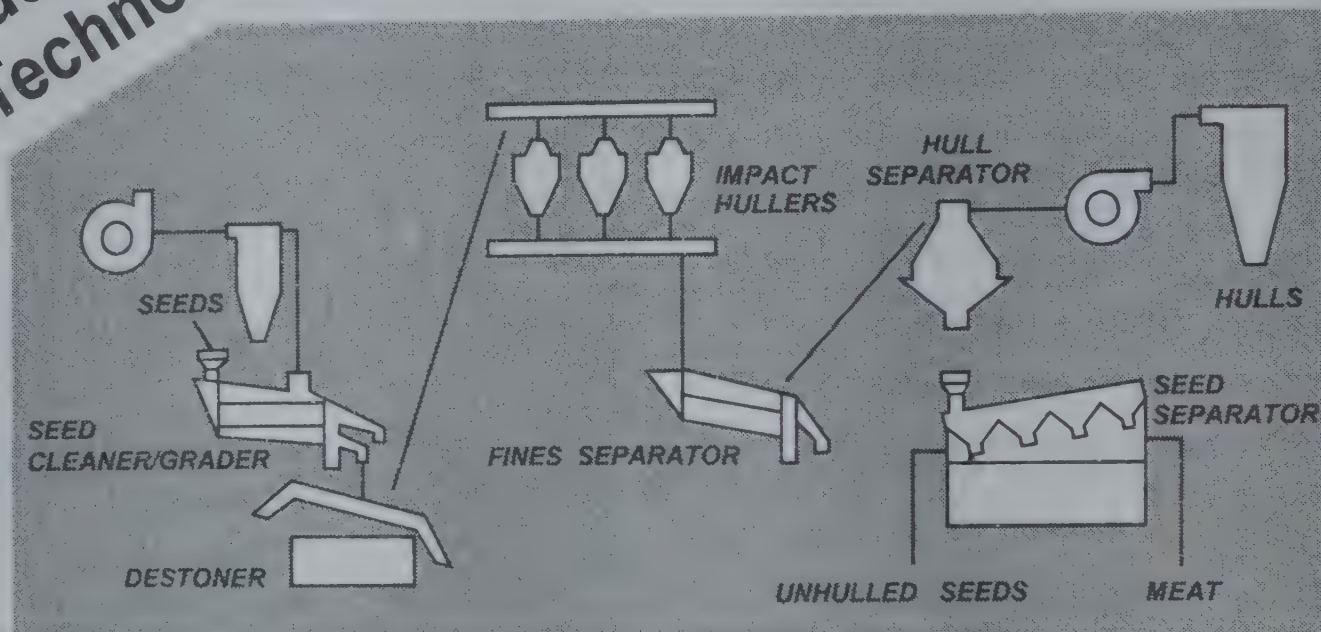
**GRIP ENGINEERS**

7/8, Meghwadi Naka, Opp. Maratha Mandir Co. Op. Bank  
Megh Wadi, Jogeshwari (E). Bombay 400 060.  
Tel : (Resi.) 645 5103, 645 5079 C/o 821 8521



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Safflower (Kardi)  
Coffee Cherry  
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Palm Kernals etc.**



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American Technological Machinerys**

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Undertaken on  
Turnkey basis**

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|--|--|
| * Cleaning & Grading system for spices, grain & seeds              | * Aeration system for seed house/silo  |
| * Storage system of seed house or silo type with precleaning plant | * Dehulling & hull Separation Systems. |
| * Oil mill plant   | * Pneumatic conveying system           |
|  | * Dust collection plant                |

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**Complete with Material Handling Equipment and Electricals**

**Many a projects completed to customers requirements to their satisfaction**

**: Kindly Contact :**

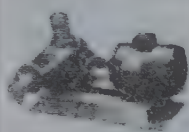
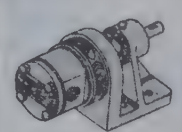
**GOLDIN (INDIA) EQUIPMENT PVT. LTD.**

**1st.Floor, Saraswati indstrial Estate, Opp.Chhani Jakat Naka, Vadodara-390002**

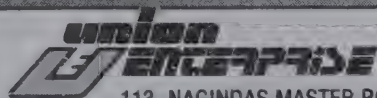
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**UNICHEM****FOOD PROCESS PUMPS  
IN ALL STAINLESS STEEL 316 QUALITY****DAIRY PUMP****SCREW PUMP****HAND PUMP****DOSING PUMP****MULTISTAGE PUMP****S.S. GEAR PUMP****M.O.C. : IN STAINLESS STEEL 316****APPLICATIONS...**

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- ★ Brewery & Beverage Industries
- ★ Water Treatment
- ★ Dairy
- ★ Vegetable Oil Milling
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- ★ Chemical Industries
- ★ Starch Industries
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113, NAGINDAS MASTER ROAD, FORT, MUMBAI-400 023.  
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Tel. : 372 46 33, 372 46 36, 372 80 33  
Fax : 022-374 60 93, 022-375 15 19

**Factory:**

Karanjari, Ratnagiri, India. Tel. 224

**ONLY PLACE FOR LIQUID BOTTLING MACHINERY****BOTTLE WASHING MACHINE**

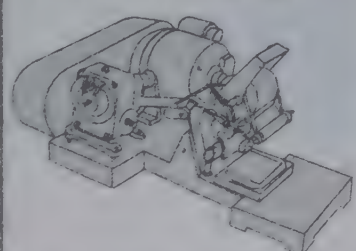
- Brush type with S.S./ Aluminium tank
- Output : 10,000 / Shift

**BOTTLE FILLING MACHINE**

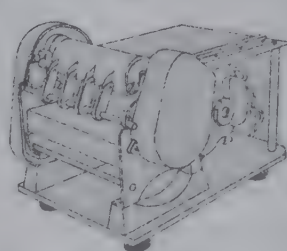
- 5 ml -1 Litre
- Complete S.S. Body
- Output : 10,000 Bottles/Shift

**BOTTLE SEALING MACHINE**

- Hand/Motor Operated
- For 8-35 mm ROPP Caps
- Output: 10,000 / Shift.

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- With Sunmica/S.S. Top
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- Powder Processing Machinery

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The name Citurgia is today synonymous with Citric Acid of the finest quality.

Citurgia caters to more than just one need in more than just one industry. Besides the traditional usage of Citric Acid in food, soft drinks, confectionery and drugs, today the uses of Citric Acid extend to new areas:

\* In the textile printing and dyeing industry it provides 'STABLE pH' conditions for polyester and nylon. As also for acrylic prints curing and cotton-resist printing. Citric Acid has successfully replaced imported Tartaric Acid because of its excellent quality,

low costs and easy availability. Also, it is a very safe acid compared to other organic and inorganic acid salts.

\* Citric Acid prevents flavour deterioration, rancidity and discoloration in edible oils.

\* It imparts an acidic taste to dry powdered drinks.

\* It is also used as a descaling solution.

Citurgia Biochemicals Ltd. is the largest producer of high quality Citric Acid in India.

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Tel: 2618071 Fax: 2613519 Gms: CITURGIA, BOMBAY Tlx: 11 86472 BDM IN



# BUYERS' GUIDE

## TO SUPPLIES & SERVICES FOR FOOD/BEVERAGE INDUSTRIES

### ACETIC ACID

Olin Chemicals, A-303 Padmavati Nagar, Gen. Arunkumar Vaidya Marg, Goregaon (E), Bombay 400 063. Tel.: 8406988, 8413111. Fax : 8734332.

### ACIDS

Ascorbic, Citric, Maleic, Benzoic, Fumaric, Muriatic, Phosphoric, Tartaric, Gibberellic, Tannic USP & Tech. etc.

Citurgia Biochemicals Ltd., Neville House, J.N. Heredia Marg, Ballard Estate, Bombay 400 038. Tel: 261 8071. Gram: CITURGIA Bombay. Tlx : 11-86472 BOM IN

Sesu Trading Corporation, 4th Flr., Sai Chambers, 367/369, Narsi Natha St., Bombay 400 009. Tel : 3414444 / 3426402. Telex : 11-72247. Fax: 11-3420832.

Star Chemicals (Bombay Ltd., 55/58, Jolly Maker Chambers No. 2, Nariman Point, Bombay 400 021. Tel: 2028029/2028728/2870165. Fax : 2027980.

Thirumalai Chemicals Limited, Maalavika Centre, 5th Floor, 144, Kodambakkam High Road, Madras 600 034. Tel : 8255755. Tlx: 041-5415 TCL IN.

### ADDITIVES, DEHYDRATED

Food Associates Bangalore, No.

132, 17th Cross, 11th Main, Malleswaram, Bangalore 560 055. Tel: 080-3340038, 3347318 Tlx : 0845-2900 PCO IN.

### ADDITIVES, FOOD & BEVERAGES

Balaji Dye Chem, 5, Prafulla Bhavan, 130, Khareghat Rd., Dadar, Bombay 400 014. Tel: 5610530/5611117/5321303 (R) Gram: BALAJI CHEM, Bombay 400 080.

Burzin & Leons Agenturen Pvt. Ltd., Readymoney Bldg. No. 1, Sir Ratan Tata Marg, Tardeo Rd., Bombay 400 034, Tel: 4944616, 4921255. Fax: 4930283.

Ganesh Benzoplast Ltd., Ganesh House, Marol, Andheri (E), Bombay 400 059. Tel: (91) (22) 8382096/8383097/8384548. Tlx: (081) 011-79164/83906 GNES IN. Fax: (91) (22) 2068475/8391529.

Kiran Kotak & Co. -- See under "Gelatine"

Olin Chemicals -- See under "Acetic Acid".

Roha Dyechem Pvt Ltd. -- See under "Food Colours".

Sesu Trading Corporation -- See under "Acids".

Varun Industries -- See under "Food Processing Equipment/

Plant"

Vin Flavours 'Viniketan' 1, Krishna Society, Hari Bhakti Extn., Old Padra Rd., Baroda 390 015. Tel: 541196/322048. Gram: VINFLA.

### ADHESIVES, HEAT RESISTANT

Manikant Brothers -- See under "Anti-Corrosion Chemicals".

### ADHESIVE/TAPES, PTFE, GLASS

Safex Systems, 84/3, Bhandup Indl. Estate, Pannalal Compd., L.B.S. Marg, Bhandup (W), Bombay 400 078. Tel : 5641788, Fax : 91-22-5671223.

Unnati Corporation, 423-425, GIDC Tele. Exch. Lane, Odhav, Ahmedabad 382 415. Tel: 873434/872277. Tlx: 121-6816 ANAR IN. Fax: 272-366505.

### AGAR AGAR (POWDER/STRIPS)

Amit Fine Chem, 14, 3rd Dharia House, Opp. Vinod Silk Mill, Ashok Chakravati Rd., Kandivli (E), Bombay 400 101. Tel: 6127988/8891730.

Caxton Phosphates & Agro Chemicals Pvt. Ltd. 32, Hansraj Karamshi Building, 70, Masjid

Bunder Road, Bombay 400 003. Tel : 3750525/3753491.

Lakh Enterprises, 182 Yusuf Meherali Rd., 1st Fl., Bombay 400 003. Tel : 375 6498. Fax: 91-22-375 5561. Tlx : 011-75096 PCO IN (ICT-85)

Hi Media Laboratories Pvt. Ltd. -- See under "Culture Media"

Kiran Kotak & Co. -- See under "Gelatine"

### AGITATORS

C.M. Equipment & Instruments (I) Pvt. Ltd., B-194, 5th Main, P.B. No. 5847, IIInd Stage, Peenya, Bangalore 560 058. Tel : 8394361/8393711. Tlx : 0845/2066 (CMEI)

Chemi-Filter Corporation, Shop No. 3, Avanti Apartments, Laxman Mahatre Rd., Dahisar (W), Bombay 400 068. Tel : 8932392; Fax : (91-22) 8018289.

Cosywo Engineering Co., -- See under "Chemical Plant & Equipment".

Fabdecon Engineers, 138, Damji Shamji Ind. Complex, Off Mahakali Caves Rd., Andheri (East), Bombay 400 093. Tel: 8347952/8343179. Grams: VACFILTER, Ghatkopar, Telex: 011-79194 FABD-IN.

Fibre & Fibre Products -- See under "Stirrers"



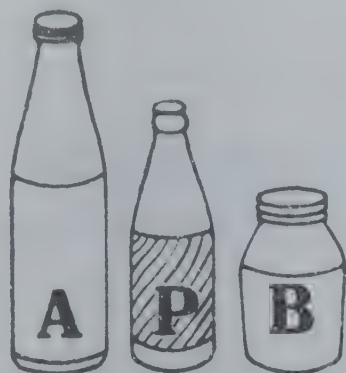
## SANTOSH ENGINEERING & FABRICATORS

Manufacturers of Boilers, Furnaces, Chemical Plant, Food Canning & Processing Machinery, Fabricators & Contractors

97, Nahar & Seth Indl. Estate, 4th Flr., Pannalal Silk Mills Compound, L.B.S. Marg, Bhandup (W), Bombay 400 078.

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Dealers In : GLASS BOTTLES, P.P. CAPS, CORKS, CAPSULES, PERFUME COSMETIC BOTTLES, PLASTIC CAPS, PLUGS, ETC.  
81, Sheriff Devji Street (Chakla), Opp. Mohammed Haji Adam & Co., Bombay 400 003.

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing."

Frigmaires Engineers, Janta Ind. Estate, Gala No. 8, Tulsi Pipe Road, Lower Parel, Bombay 400 013. Tel: 4945624/4926159. Tlx: 011-75984 FRIG IN.

Mamko Process Equipments -- See under "Emulsifiers".

### AGRI COMMODITIES

Premji Ghellabhai & Co. 3 Chinch Bunder, Bombay 400 009. Fax: 3738394/4951837. Tlx: 011-75505 PGCO IN. Tel: 376310/3762945.

### AIR BLOWERS

Indcon Polymech Limited, 311, Mansarovar, 90, Nehru Place, New Delhi 110 019. Tel: 6431908/6436869/6438365. Tlx: 031-61678. Fax: 11-6464994.

### AIR CLASSIFIERS

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

### AIR CURTAINS

Donromos Private Ltd. -- See under "Air Conditioning Refrigeration Plants & Equipment"

### AIRCONDITIONING/ REFRIGERATION PLANT & EQUIPMENT

Advance Equipment Company, Navjivan Society, Building 3/2/7, Bombay Central, Bombay 400 008. Tel: 308 7175/620 0969. Fax: 022-6245950.

Donromos Private Ltd., A-4 Girikunj Ind. Estate, 34 Off Mahakali Caves Rd., Andheri (E), Bombay 400 093. Tel : 8328121/8348633/8348799. Gr: MIRDON. Fax : 022-8218830.

Industrial Refrigeration -- See under "IQF Spiral Freezer"

Saffaire India, 51, Juhu Supreme Shopping Centre, Gulmohar Cross Rd., No. 8, J.V.P.D. Scheme, Bombay 400 049. Tel: 6203998. Cable: SAFRIGE

Synergy Agro-Tech (P) Ltd., 209 Ashoka Chambers, Rasala Marg, Mithakhali, Ahmedabad 380 006. Tel/Fax : 79-6427219

### AIR CURTAINS

Pest Control (I) Ltd., 127, Keytuo Estate, 220, Kondivita Lane, Andheri, Bombay 400 059. Tel : 8213546, Fax : 8221647.

### AIR DRYERS

C.M. Equipment & Instruments (I) Pvt. Ltd. -- See under "Agitators"

MVS Engineering Ltd., MVS House, E-24, East of Kailash, New Delhi 110 065. Tel : 6431908/6434511/6432398; Fax : 011-6464994/6422654; Tlx : 031-62332.

Sakav Enterprises, 12/82, Govind Nagar, Sodawala Lane, Borivali (West), Bombay 400 092. Tel: 8010250.

### AIR/DUST/FUME CONTROL

Donromos Private Ltd. -- See under "Airconditioning/Refrigeration Plant/Equipment".

Rathi Industrial Equipment Co. Ltd.-- See under "Size Reduction Equipment"

Thor Systems (A Div. of Surger Exim Inc.) 206 Bake House, Maharashtra Chamber of Commerce Lane, Kalagodha Fort, Bombay 400 023. Tel : 2846222. Fax : 2057448.

### AIR HEATERS

Ross Thermal Systems Pvt. Ltd. -- See under "Steam Boilers"

### AJINOMOTO

Ace International -- See under "Guar Gum"

Kiran Kotak & Co. -- See under "Gelatine"

Lakh Enterprises -- See under "Agar Agar (Powder/Strips)"

Sesu Trading Corporation -- See under "Acids".

### ALIGINATES

Burzin & Leons Agenturen Pvt. Ltd.-- See under "Additives, Food & Beverage"

### ANALYTICAL TESTING LABORATORY

Bangalore Test House -- See under "Laboratory, Testing".

### ANALYSERS

Technovation, 4 Paramel, St. Cyril's Rd., Bandra, Bombay 400 050. Tel: 6400678. Fax: 91-22-6443425.

### ANTI-CORROSION CHEMICALS

Manikant Brothers, 311, New Anant Bhuvan, 257/65 Narsi Natha St., Bombay 400 009. Tel: 375 2881/375 6977. Telex: Care-011-74491 TEXOIN. Fax: Care 91-22-3750388.

### ANTI-POLLUTION SYSTEMS

Pest Control (I) Ltd. -- See under "Air Curtains"

Thor Systems -- See under "Air/Dust/Fume Control"

### ANTI-OXIDANTS

Camlin Ltd. (Pharma & Fine Chemicals Div.), Camlin House, J. B. Nagar, Andheri (East), Bombay 400 059. Tel: 8366635. Fax: (91) 22-8366579.

Olin Chemicals -- See under "Acetic Acid".

Panorama Industries, W-24, MIDC, Phase II, Shivaji Udyog Nagar, Dombivli 421 204. Tel: 470 486, 473333. Fax : 470031.

Quality Industries, W-50, MIDC, Phase II, Manpada Road, Dombivli 421 204 (E). Tel : 470431/473333. Fax : 470031.

Sesu Trading Corporation -- See under "Acids".

Vini-Chem Laboratories, 5 Girdhari Bhavan, 48, A/B Sadashiv Cross Lane, Bombay 400 004. Tel: 358578. Gr: FORMALIN

### AROMATIC CHEMICALS

Aroma Impex, 55/57 Nagdevi Cross Lane, 1st Flr. Bombay 400 003. Tel : 340 1109/3445456. Fax : 22-3442211.

Aromatic Chemical & Oil Co. Pvt. Ltd., D, 7-8, Indl. Estate, Visakhapatnam 530 007. Tel : 0891-559039. Fax : 0891-556014.

Dewang Corporation, S-3 Navrang, Swastik Char Rasta, Navrangpura, Ahmedabad 380 009. Tel : (91-79) 656 8012, 380009. Tel: (91-79) 6568012.



464019. Fax : (91-79) 442 199, 462009.

Gupta & Company Ltd. -- See under "Essential Oils"

Harish C. Khosla & Co. -- See under "Essences & Flavours".

IDL Chemicals Ltd.,  
Kukatpally, Sanathnagar (I.E.),  
Hyderabad 500 018. Tel : 270742/  
264161. Fax: 91-40-270772.

L. B. Aroma & Chemicals, 4,  
Omex Chambers, Gr. Fl., Telli  
Galli Rd., Andheri (East), Bombay  
400 069. Tel: 8326277. Fax:  
6107700.

Rakesh Sandal Industries, 7/  
177 'A' Swaroop Nagar, Kanpur 208  
002. Fax: 91-512-294675.

Sesu Trading Corporation --  
See under "Acids".

Sonarome Chemicals Pvt. Ltd.,  
No. C-136, Peenya Indl. Area,  
Peenya 2nd Stage, Bangalore 560  
058. Tel: 8394804/8395595. Fax:  
3334802/2200016. Tlx: 845-8848.

## AUTOCLAVES

Fabdecon Engineers -- See un-  
der "Agitators".

Food Tech Engineers -- See  
under "Machinery, Food &  
Beverge Processing"

M. F. Marketing Pvt. Ltd., B-  
15, Arjun Centre, B.S. Devshi  
Marg, Govandi, Bombay 400 088.  
Tel: 5557515/5560947. Fax: 01-  
22-5560569.

Machinfabrik -- See under  
"Coolers, Vacuum, Batch"

Techno Equipments -- See un-  
der "Food Processing Equipment/  
Plant".

Thor Systems -- See under "Air/  
Dust/Fume Control"

## AUTOMATIC FORM- FILL-SEAL MACHINES

Unique Flexo Packaging, Gala  
No. B-270, Joshiwadi, Off  
Manpada Road, Opp. Kasturi Pla-  
za, Dombivli (E), 421 201. Tel:  
5785723/711-462272.

## BAGGING & WEIGHING MACHINES

Bombay Engineering Industries  
-- See under "Filling Machines,  
Powder/Granules"

## BAKERY/BISCUIT EQUIPMENT

Admir Engineers, Plot No. 1/  
E-4 Shivaji Nagar, Govandi,  
Bombay 400 043. Tel: 5511718/  
5568446/5518182. Fax: 91-22-  
5568446.

Advance Equipment Co., See  
under "Airconditioning/Refrigera-  
tion Plant & Equipment"

Aifso Enterprises -- See under  
"Ovens, Bread/Biscuit Baking"

Continental Equipment India  
Pvt Ltd., 1E/1 Jhandewalan Exten-  
sion, Link Rd., New Delhi 110 055.  
Tel: 521282 & 7524767. Cable :  
Efficient. Tlx: 031-66706 CANT  
IN. Fax: 011-7524767.

Fabdecon Engineers -- See un-  
der "Agitators".

Frigmaires Engineers -- See  
under "Agitators".

Grovers Private Limited, 228,  
Kaliandas Udyog Bhavan, Near  
Century Bazar, Bombay 400 025.  
Tel: 4303223/4309935/4309467.  
Tlx: 011-71672. GRIN IN. Cable  
GROFROST.

Indian Foods Private Ltd., 171,  
K.K. Nagar, Madurai - 625020.  
Tel: (0452) 42776. Fax: 91-452-  
41511.

J.M.B. Engineering, Shop No.  
2, Shed No. 3, Kondivitta Road,  
Behind Diamond Restaurant,  
Andheri (E), Bombay 400 059. Tel:  
8363113/8380538.

Kothari Fermentation &  
Biochem Ltd. -- See under "Yeast,  
Bakers"

Prima Engg. Industries, T-113,  
MIDC., Bhosari Indl. Area, Pune  
411 026. Tel : 790 621.

Sakav Enterprises -- See under  
"Air Dryers".

Sarlech Enterprises (India),  
14462/1 Bhagwan Nagar, Near  
Savitri Complex, G.T. Rd.,  
Ludhiana 141003. Tel: 531444. Gr  
: SARLE-HEAT, Tlx : 0386-384  
PSIC - IN - ATTN. Fax: (091-161)  
532 871.

## BAKING POWDER

Lakh Enterprises -- See under  
"Agar Agar (Powder/Strips)"

## BALANCES ELECTRONIC

Lab Instruments, 78(B)  
Jaganath Sankar Seth Rd.,  
"Ratnadeep", (Near Roxy Cinema)  
Opera House, Bombay 400 004.  
Tel: 3610973. Fax: 3680440

## BARRELS/BINS, ETC.

Aifso Enterprises -- See under  
"Ovens, Bread/Biscuit Making"

Ratnajeet Polycon Ltd., 2,  
Jawahar Nagar, S.V. Road,  
Goregaon (West), Bombay 400  
104. Tel: 8727479/8727480, Fax:  
91-22-8737071

## BARRIER BAGS

W.R. Grace & Co. (India) Pvt.  
Ltd. -- See under "Packaging Ma-  
terials"

## BATCHING & CODING SYSTEMS

Acme Scales Company, 342-C  
Grant Rd., Nr. Super Cinema,  
Bombay 400 007. Tel: 3081198,  
Gr: ACMESCALES.

Codex Enterprises, 601 'A'  
Block, 6th fl., B.G. Towers, O/S  
Delhi Gate, Ahmedabad 380 004.

## BEEF EXTRACTS

Hi Media Laboratories Pvt. Ltd.  
-- See under "Culture Media"

## BELTINGS

Unnati Corporation -- See un-  
der "Adhesive/Tape, PTFE,  
Glass".

## BENZOIC ACID

Ganesh Benzoplast Ltd. -- See  
under "Additives, Food & Bever-  
age".

## BEVERAGE CLOUDING AGENT

Fine Organics -- See under

"Emulsifiers, Food".

## BEVERAGE PROCESSING MACHINERY

Goma Engineering Pvt. Ltd.,  
Majiwada, Behind Universal  
Petrol Pump, Thane 400 601  
(Bombay). Tel : 534 0875/1937/  
6436/1438/6121. Fax : 0091-22-  
533 3634, Tlx : C/o. 011-72389  
TCWE IN A/c. No. 56.

## B H A

Amit Fine Chem. -- See under  
"Agar Agar (Powder/Strips)".

Concorde Chemical Corpora-  
tion, 205, Pinky Palace, No. 760,  
S.V. Road, Khar West, Bombay  
400 052. Tel: 6463601/6463597.  
Fax: 022-646-3940.

Olin Chemicals -- See under  
"Acetic Acid".

Sesu Trading Corpn. -- See un-  
der "Acids".

## BHATTIES, KEROSENE/ DIESEL

Liberty Industries, A-1/3  
Shivaji Indl. Assoc., Vakola  
Bridge, Santacruz (East), Bombay  
400 055. Tel: 8365774/8375887/  
6120301.

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Phone: 8010250 • Fax: (22) 8010250



## **BISCUIT/BREAD MAKING MACHINES**

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking"

Bombay Industrial Engineers -- See under "Food Processing Equipment/Plant"

Frigmaires Engineers -- See under "Agitators".

## **BLENDERS & MIXERS**

C.M. Equipment & Instruments (I) Pvt. Ltd. -- See Under "Agitators"

Cosywo Engineering Co.-- See under "Agitators"

Fabdecon Engineers -- See under "Agitators".

Food Tech Engineers -- See under "Machinery Food & Beverage Processing".

Frigmaires Engineers -- See under "Agitators".

Mamko Process Equipment Manufacturers -- See under "Emulsifiers".

## **BLISTER SEALING MACHINE**

Machinecraft, 5 Navbhavna, 422 V.S. Marg, Prabhadevi, Bombay 400 025. Tel : 4221633/4226881. Fax : 4221633.

## **BOILERS**

Cinni Engineering Pvt. Ltd., Rainbow Indl. Estate, Behind Arvind Works, 'Vyaravali', M.I.D.C., Andheri (E), Bombay 400 093. Tel: 8328887/8300278. Gr: TECHITHERM.

Classic Enterprises, 101 Jehangir Mansion, Behind Metro Cinema, Bombay 400 020. Tel: 2088291/2058916.

Kalpna Boilers and Chemical Plants Mfg. Co., 18, Kailas Park, Chirag Nagar, L.B.S. Marg, Ghatkopar (W), Bombay 400 086. Tel: 5125352/5129796.

Ross Thermal Systems Pvt. Ltd. -- See under "Steam Boilers"

Santosh Engineering & Fabricators, 97 Nahar & Seth Indl. Estate, 4th Fl., Pannalal Silk Mills Compound., L.B.S. Marg, Bhandup (W), Bombay 400 078. Tel: 5612746.

## **BOILER FEED PUMPS**

Raj Pumps, P.O.Box 90, M.I. Rd., Jaipur 302 001. Tel: 372308/372949.

## **BOPP FILM**

Petrox Private Ltd., Near Indi-

an Oil Installation, Wadala East, Bombay 400 037. Tel: 4122667/4122696/4132704. Tlx : 11-76080 PG IN. Fax: (91-22) 4147544.

## **BOPP PACKING TAPES**

Acme Packaging, 10, Topiwalla Mansion, 1st Fl., Above Patel Restaurant, 93/97 Mohamadali Road, Bombay 400 003. Tel: (Off.) 3432601 (Resi) 8725294

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## **BOTTLE CAPS & CLOSURES**

Clair Packagings Pvt. Ltd., 8, Sheriff Devji St., Bombay 400 003. Tel : 3420381/2, 3441578.

Larsen & Toubro Ltd., (Packaging Div.), G-4 Bldg., Powai Works, Saki Vihar Rd., Bombay 400 072. Tel: 5781249, 5781401, 5781411. Fax : 91-022-5781358/5783437/5783927. Grams: POWAI WORKS. Tlx : 011-71693/79406.

## **BOTTLE FILLING & SEALING MACHINES**

Autopack Machines Pvt. Ltd., 101-C Poonam Chambers, Dr. Annie Besant Road, Worli, Bombay 400 018. Tel : 4924806, 4925900, 4964926. Fax : (022) 4964926. Tlx : 11-73798

Magumps, Trisandhya 'A' Bldg., 97 D. Phalke Rd., Dadar, Bombay 400 014. Tel : 4113572, 415 4474.

Shivsu Watek (P) Ltd. -- See under "Mineral Water Filling Machinery"

## **BOTTLE FILLERS**

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Unique Flexo Packaging -- See under "Automatic Form-Fill-Seal Machines".

Techno Equipments -- See under "Food Processing Equipment/Plant".

## **BOTTLES & JARS, GLASS**

A.P. Batliwalla -- See under "Crates, Plastic".

A to Z Bottle Suppliers, 81 Sheriff Devji St., (Chakla) Opp. Mohammed Haji Adam & Co., Bombay 400 003. Tel: 3415294. Fax: 3733701.

Divecha Glass Industries, 155, Maker Chambers VI, 220 Nariman Point, Bombay 400 021. Tel:

241157/241167.

R.G. Glass Agency, 244, Maulana Azad Road, (North) Opp. Urdu Times, Bombay 400 008. Tel: 3072326/3086984/3099896/3096218. Grams: SUPER-GLASS. Fax : 91-022-3010223.

Star Glass Works, 299, Kurla Andheri Road, (Jari Mari), Bombay 400 072. Tel: 5111211/5111827/8. Cables: STARBOTTLE. Fax: 011-73345 SGW IN.

## **BOTTLE INSPECTORS**

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

J.T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

## **BOTTLE WASHING CHEMICALS**

Chemofarbe Industries, 33 New Islam Mill Compound, Mahadev Palav Marg, Near Bharat Mata Cinema, Curry Rd. (E), Bombay 400 012. Tel/Fax: 4126898, 4137674. Gr.: CHEMOPOWER Bombay 400 012.

## **BOTTLE WASHERS & RINSERS**

Acmevac Sales Pvt. Ltd., 109, Unique Industrial Estate, Cardinal Gracias Road, Chakala, Andheri (E), Bombay 400 093. Tel: 8329647/8300619.

Jaykay Industries, 21/2-B Vasanthpura Rd. Post, Doddakalasandra, Bangalore 560 062. Tel: 648815.

Pharmaco Machines, Gr. Flr., Pandit House, Behind Nagrik Stores, Station Rd., Thane 400 601. Tel: 533 2245/536 3722. Fax : 91-22-5331084.

## **BOTTLING PLANTS**

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Geeta Food Engineering -- See under "Food Processing Equipment/Plants."

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Kamal Bottling Co., Plot No. 89, Ahmednagar, Indl. Estate, Co-Op. Soc. Ltd., Nagar-Pune Road, Kedgaon, Ahmednagar 414 005. Tel : 41948.

Larsen & Toubro Ltd., L & T House, Ballard Estate, Bombay 400 001. Tel : 261 8181, 261 8182. Fax : 91-22-262-0223. Tlx : 11-80020 Gr: LARSEN BRO.

Pharmaco Machines -- See under "Bottle Washers & Rinsers"

Simtools Limited, 2nd Pokhran Rd., Thane 400 606.

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New Indo International (Regd.)-- See under "Pillow Pack Packing Machinery"

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machinery"

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Fabdecon Engineers -- See under "Agitators".

J.M.B. Engineering -- See under "Bakery/Biscuit Equipment".

Prima Engg. Industries -- See under "Bakery/Biscuit Equipment"

## **BREAD QUALITY IMPROVER**

Fine Organics -- See under "Emulsifiers, Food"

Kothari Fermentation and Biochem Ltd. -- See under "Yeast, Bakers"

## **BREAD SLICER**

J.M.B. Engineering -- See under "Bakery/Biscuit Equipment".

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Ducon Equipments (P) Ltd.-- See under "Conveyor Systems"

Shivsu Watek (P) Ltd. -- See under "Mineral Water Filling Machinery"

Vishal Equipments, B-54, A.P.I.E., Balanagar, Hyderabad 500037. Tel : 270768/634901. Gr: VISHAL TANK

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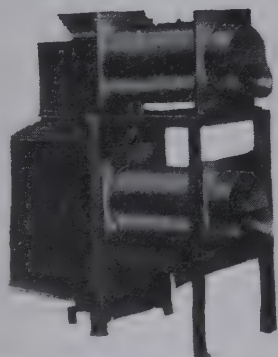
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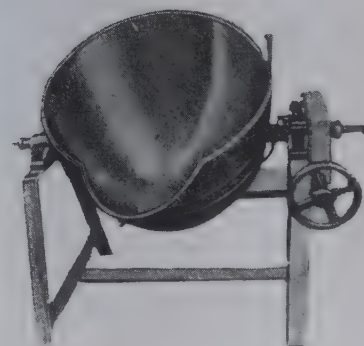
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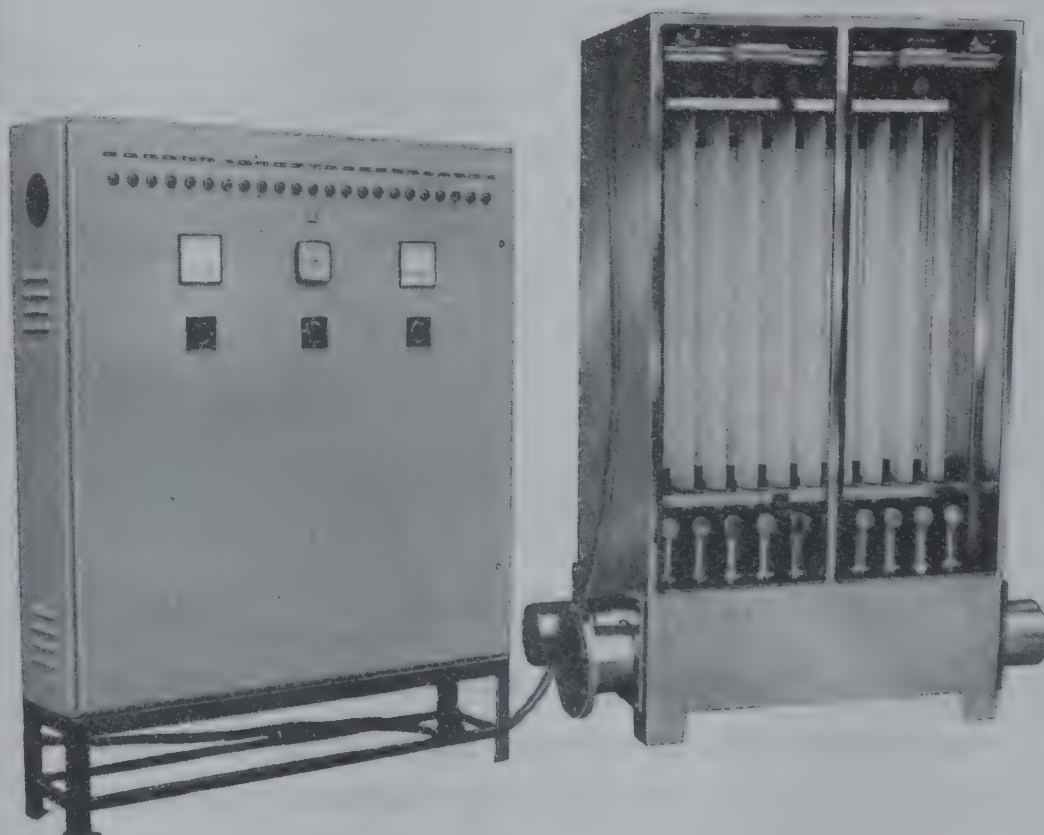
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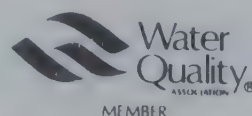
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Frigmaires Engineers -- See under "Agitators".

J.M.B. Engineering Works -- See under "Bakery/Biscuit Equipment".

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## CALCIUM CARBONATE

Citurgia Biochemicals Ltd. -- See under "Acids".

## CALCIUM CITRATE

Aditi Pectins Pvt. Ltd. -- See under "Pectins"

Vidarbha Fruit Products Pvt. Ltd., B/5 Rajdarshan Basement - B. Opp. Rly. Platform No. 6, Thane West 400 602. Tel : 022-5404782

## CALCIUM PROPIONATE

Ajanta Products Company -- See under "Food Colours"

Fine Organics -- See under "Emulsifiers, Food".

Sesu Trading Corp. -- See under "Acids".

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C.M. Equipment & Instruments (I) Pvt. Ltd. -- See under "Agitators"

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## CANS & CONTAINERS

Petrox Private Ltd. -- See un-

der "BOPP Film"

## CAN CLOSING & SEAMING MACHINES

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Tinmaco Engg. Co. -- See under "Tin Can Making Machinery"

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chines".

Samarpan Fabricators Ltd. --  
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chinery".

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5690572. Fax: 0091-22-5649312.

Santosh Engineering & Fabri-  
cators -- See under "Boilers".

Tinmaco Engg. Co. -- See un-  
der "Tin Can Making Machinery".

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der "BOPP Film"

Standard Tin Works -- See un-  
der "Caps & Closures".

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der "Agitators".

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A to Z Bottle Suppliers -- See  
under "Bottles & Jars, Glass".

Larsen & Toubro Ltd. -- See  
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Standard Tin Works, Standard  
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Harish C. Khosla & Co. -- See  
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Micron -- See under "Water  
Sterilizers".

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### CATERING EQUIPMENT

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### CELLULOSE PRODUCTS

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See under "Acids".

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### CENTRIFUGES

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ments (I) Ltd. -- See under "Agita-  
tors"

Filtron India -- See under  
"Dairy Plant & Equipment".

Food Tech Engineers -- See  
under "Machinery, Food & Beverage  
Processing"

Frigmaires Engineers -- See  
under "Agitators".

Kalpna Boilers & Chemicals  
Plants Mfg. Co. -- See under "Boil-  
ers".

Magumps -- See under "Bottle  
Filling & Sealing Machines"

Sharplex Agro Process (I) Pvt.  
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Projects".

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Food Tech Engineers -- See  
under "Machinery, Food & Beverage  
Processing"

Goma Engineering Pvt. Ltd. --  
See under "Beverage Processing  
Machinery".

The Panchal Workshop -- See  
under "Candy/Lolly Making Ma-  
chine".



## CHEMICALS, FINE

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Camlin Ltd. -- See under "Anti Oxidants".

Fine Organics -- See under "Emulsifiers, Food".

Hindustan Chemical Industries, 77-B, Juhu Supreme Shopping Centre, Gulmohr Rd., Juhu, Bombay 400 049. Tel : 620 5464/625 1836. Gr: BASICHEM. Fax : 91-22-6204 121.

Hitashi Chemical, 11 Ezra St., Calcutta 700 001. Tel : 2479541/2471759/2254099/2253348. Fax : 033-2479738/407173.

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Sesu Trading Corporation -- See under "Acids".

Thirumalai Chemicals Limited -- See under "Acids".

## CHEMICAL PLANT & EQUIPMENT

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Fabdecon Engineers -- See under "Agitators".

Fibre & Fibre Products -- See under "Agitators"

Frigmaires Engineers -- See under "Agitators"

Santosh Engineering & Fabricators -- See under "Boilers".

## CHEWING GUM MACHINERY

Bombay Industrial Engineers -- See under "Food Processing Equipment/Plant"

## CHILLING PLANTS

Grovers Private Ltd. -- See under "Bakery/Biscuit Equipment".

Kooling System, 35 Mannar Reddy Street, T. Nagar, Madras 600 017. Tel : 044-4342220/4348633. Gr: RITEWAYS. Fax : 044-4343577.

MVS Engineering Ltd. -- See under "Air Dryers"

## CHOCOLATE MAKING MACHINES

Fabdecon Engineers -- See under "Agitators"

## CITRIC ACID

Ace International -- See under "Guar Gum".

Alok Chem Corporation -- See under "Guar Gum".

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Citurgia Biochemicals Ltd. -- See under "Acids".

Gipsicko Laboratories (P) Ltd., 37/41, Mahalaxmi Indl. Estate, Village Iyava, Ta. Sanand, Dist. Ahmedabad 382 110. Tel : (079) 2873537, 2113772. Fax : 91-079-5838408. Gr: GIPSICO.

Kiran Kotak & Co. -- See under "Gelatine"

Sesu Trading Corporation -- See under "Acids".

## CITRIC ACID/ ANHYDROUS

Amit Fine Chem.-- See under "Agar Agar (Powder/Strips)"

Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

## CITRONELLA OIL

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## CLEANING PRODUCTS

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## CLIMATE CONTROL EQUIPMENT

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## COCOA BUTTER

Sesu Trading Corp. -- See under "Acids"

## COCOA POWDER

Balaji Dye Chem -- See under "Additives, Food & Beverage"

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Olin Chemicals -- See under "Acetic Acid".

Sesu Trading Corporation -- See under "Acids".

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## COCONUT PROCESSING PLANT

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants / Projects".

## CODING INK

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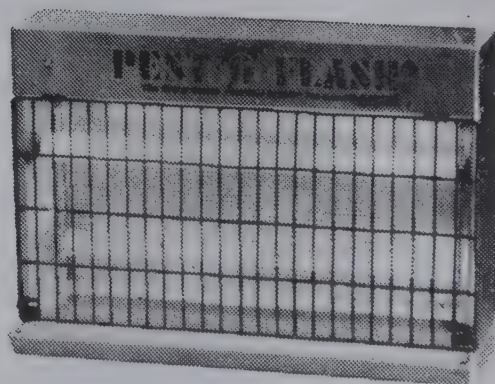
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Orbit International Technologies P. Ltd. -- See under "Machinery, Potato Processing"

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Donromos Private Ltd. -- See under "Air Conditioning/Refrigeration Plant & Equipment"

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## CONCENTRATOR, FRUIT JUICE

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

## CONCENTRATES & EXTRACTS

Aditi Pectins Pvt. Ltd. -- See under "Pectins"

BEC Foods, 31 Maker Chambers III, Nariman Pt., Bombay 400 021. Tel : +91-22-2871331/283 1784. Fax : 287 3611.

Fabdecon Engineers -- See under "Agitators"

Gupta & Company Ltd. -- See under "Essential Oils"

## CONDENSED MILK PLANT

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery/Plant"

## CONDENSORS, EVAPORATIVE

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(I) Pvt. Ltd. -- See under "Refrigeration Equipment/Plant"

## CONFECTIONERY MACHINES

See also under "Machinery, Confectionery"

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Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Tricon Food Machinery Co.-- See under "Food Processing Equipment/Plant".

Varun Industries -- See under "Food Processing Equipment/Plant"

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Ducon Equipments Pvt. Ltd., 6 Alpana, 2nd Fl., Peddar Rd., Bombay 400 026. Tel : 388-8294/532 2395/579-0271. Fax : 0091-22-5787929.

Project & Technology Group, 1-E, JIA Sarai, IIT, Hauz Khas, New Delhi.

Synergy Agro-Tech (P) Ltd.-- See under "Air - Conditioning/Refrigeration Plant/Equipment"

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Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking"

Divecha Glass Industries (Metal Containers Div.), 249 Bal Rajeshwar Rd., Mulund (W) Bombay 400 080. Tel : (022-5612548/5617559; Fax : (022) 5671711; Cable : GLASSUNIT; Tlx : 011-85226 GLASS IN.

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Petrox Private Ltd. -- See under "BOPP Film"

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Cosywo Engineering Company -- See under "Chemical Plant & Equipment"

Metal Plants, 2/17, Anupam Ind. Estate, Lal Bahadur Shastri Marg, Mulund, Bombay 400 080. Tel: 5614439/5610628.

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Crystal Automation Pvt. Ltd. .. See under "Pneumatic Conveying Systems"

Ducon Equipments (P) Ltd. 6, Alpana, 2nd Fl., Peddar Rd., Bombay 400 026. Tel : 388-8294. Fax : 91-22-578-7929.

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing"

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Selvel Conveyors -- See under "Material Handling Systems"

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Waghela Brothers, Oswal Compound, Ltt Bhathi, Pandit Nehru Rd., Near W.E. Highway, Goregaon (E), Bombay 400 063. Tel : 874 4131. Fax : 874 6502.

## CONVEYOR COMPONENTS

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Supertech Components, 3 Kantilal Bldg., 1st Fl., Azad Lane, S.V. Rd., Andheri (West) Bombay 400 058. Tel : 8878663/8872303. Fax : 8870605

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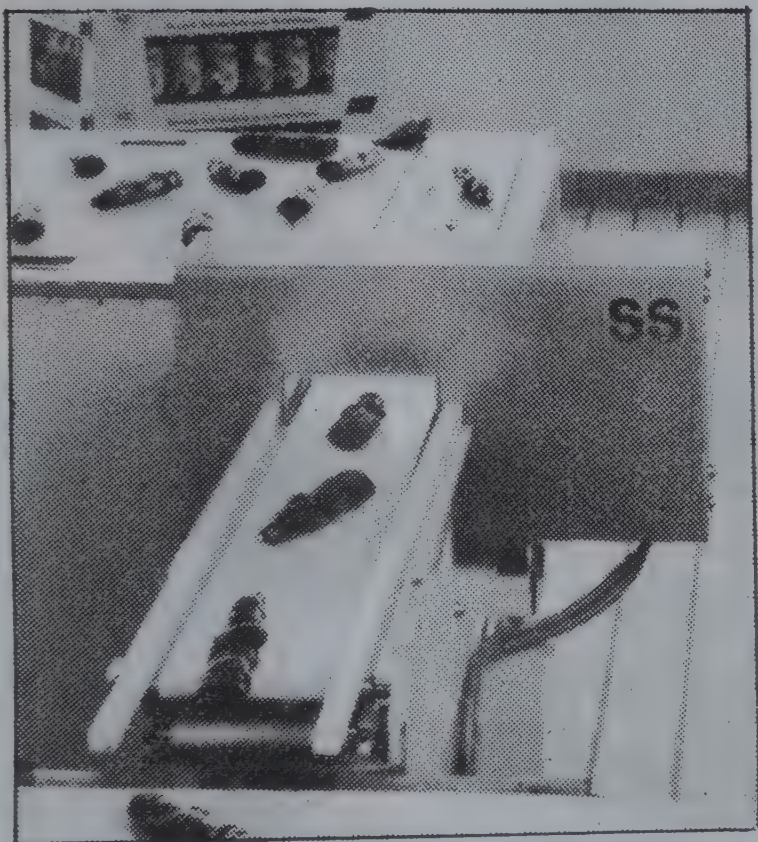
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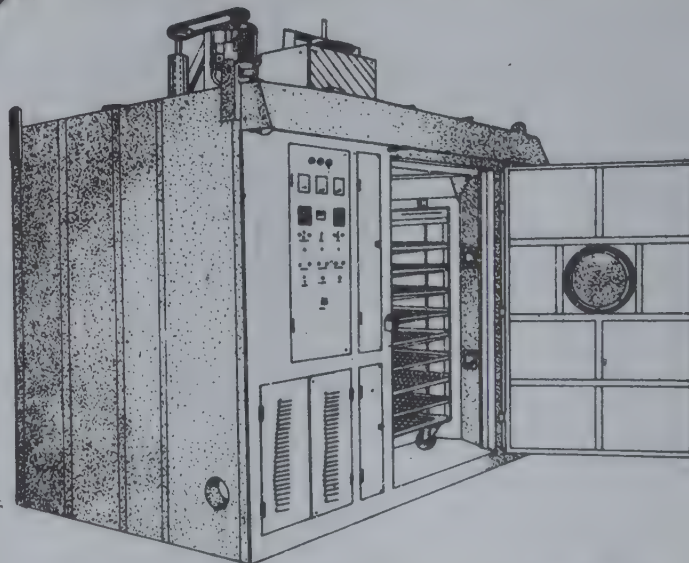
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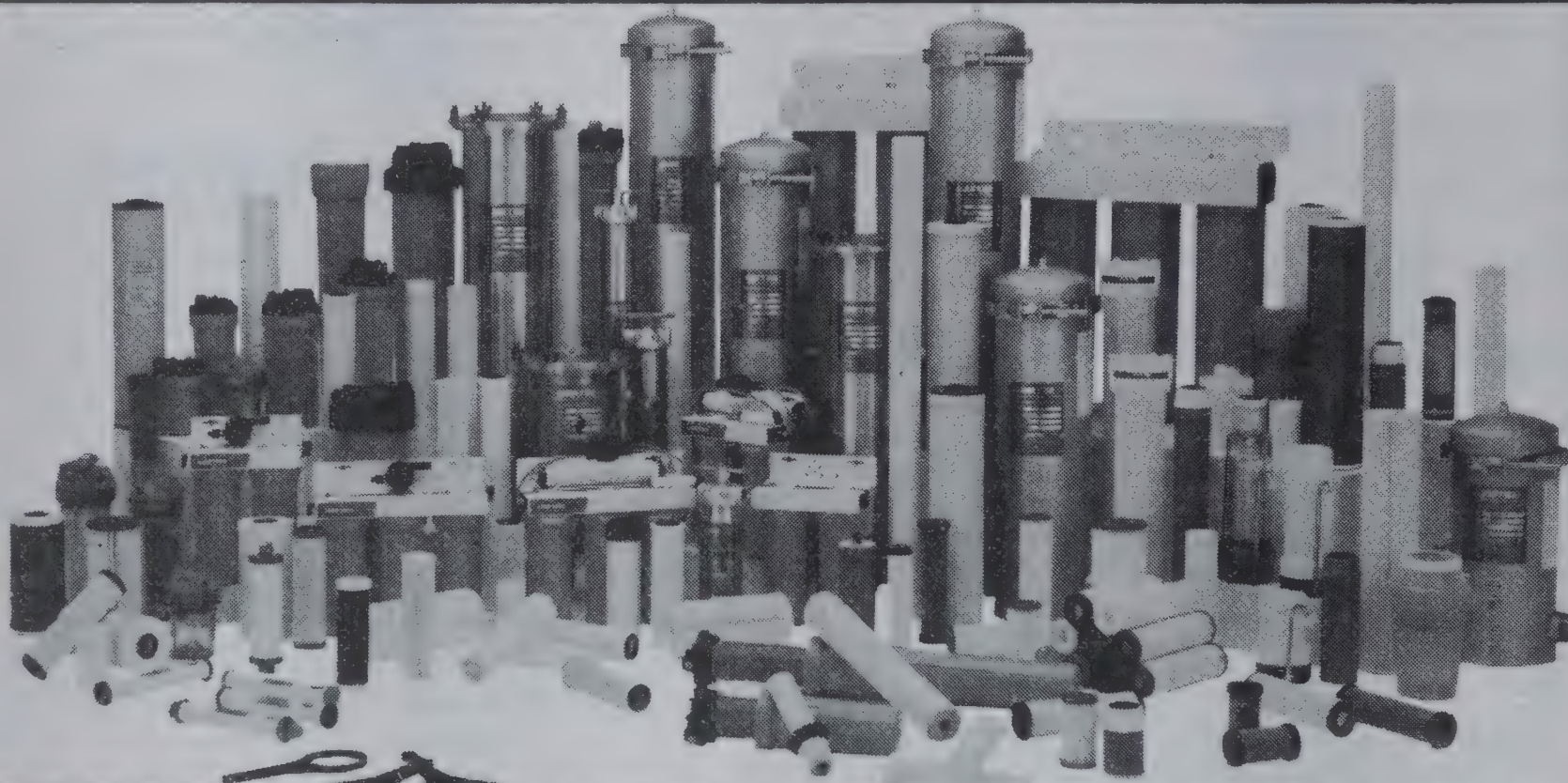


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Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Dairy Udyog, C-229A/230 A Ghatkopar Indl. Estate, LBS Marg, Bombay 400 086. Tel : 5171960/5171636. Fax : 5170878.

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Orbit International Technologies Pvt. Ltd. -- See under "Machinery, Potato Processing"

## **DEMINERALISER**

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"Water Treatment Plants/Equipment"

Factor Engineering Co. Pvt. Ltd., A-1/104 Govardhan Nagar, Mulund (W) Mumbai 400 080. Tel/Fax: 5601361

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Micron -- See under "Water Sterilizers".

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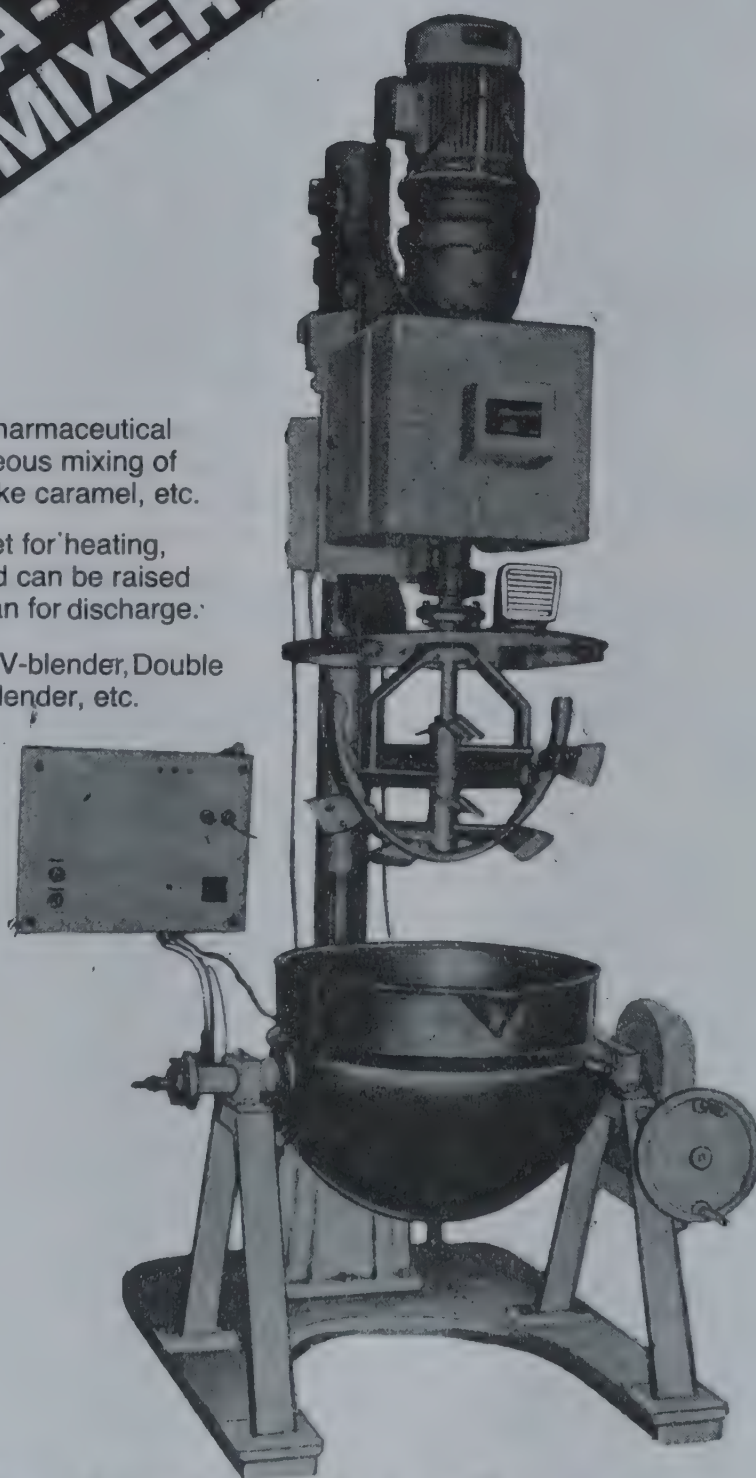
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der "Machinery, Food & Beverage  
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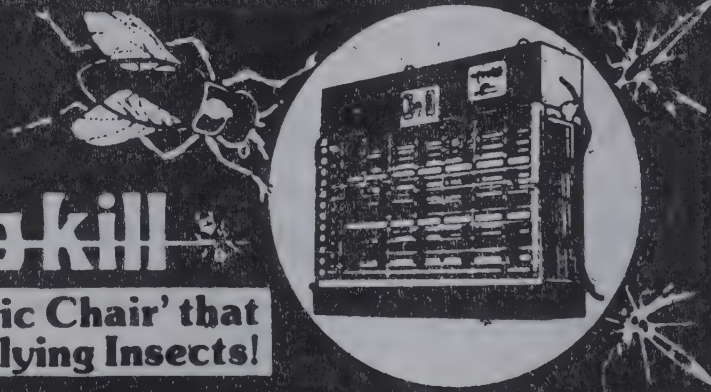
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J. J. Jackson & Co. Post Box  
27, Nanpura, Surat 395 001. Tel :  
23365.

M.C. Davar Aromatics Pvt.  
Ltd., 266 B, J. Dadaji Marg,  
Hormazd Mansion III Floor, Opp.  
Bhatia Hospital, 266BJ, Dadajee  
Marg, Bombay 400 007, Tel:  
3879468, 3865189. Tlx: (11)  
73757 DAVR IN.

Oror Flavours & Chemicals Pvt.  
Ltd. -- See under "Food Flavours".

Red Club Flavours Pvt. Ltd., C-  
75, Kirti Nagar, New Delhi 110  
015. Tel : 5451142, 5431556. Fax  
: 91-11-2913549. Gr: REDCLUB.

Sesu Trading Corporation --  
See under "Acids".

Sonarome Chemicals Pvt. Ltd.  
-- See under "Aromatic Chemi-  
cals".

Universal Food Flavours -- See  
under "Dusting Flavours"

## ESSENTIAL OILS

Bhagat Impex Pvt. Ltd., 164  
Sitaram Podar Marg, 1st Fl.,  
Bombay 400 002. Tel: 2086928/  
2016995. Tlx: 011-80056BGIL IN.

Gujarat Essence Mart Pvt. Ltd.  
-- See under "Colours, Food & Bev-  
erage"

Gupta & Company Ltd., XIV/  
294, Gali Mandi Pan, Sadar Bazar,  
Delhi 110006. Tel: 7774742/  
528923/527795. Tlx: 31-66075  
GCPL-IN. Fax: 011-7519215 Ca-  
ble: AROMA DELHI 110006.

Harish C. Khosla & Co. -- See  
under "Essences & Flavours"

Hitashi Chemicals -- See under  
"Fine Chemicals".

Jupiter Trading Company, 18  
Devkaran Mansion's Chowk, 20  
Mangaldas Rd., Bombay 400 002.  
Tel: 2054710, 8385129, 6145310.

Olin Chemicals -- See under

"Acetic Acid".

Rakesh Sandal Industries -- See  
under "Aromatic Chemicals"

Sesu Trading Corporation --  
See under "Acids".

## ETHYL VANILLIN

Concorde Chemical Corp. --  
See under "B H A".

Intel Corporation, 102  
Kunal, 1st Rd., Opp. Madhu  
Park, Khar West, Bombay 400  
052. Tel: 6460292/6483790,  
Fax: 022-646 3940.

## EVAPORATORS

Filtron Engineers Ltd. -- See un-  
der "Dairy Plant & Equipment"

SSP Pvt. Ltd., 19 DLF Indl.  
Area II, 13 Milestone, Mathura  
Rd., Faridabad 121003. Tel: 0129-  
275968/277442; Fax : (091)0129-  
277441/011-6847665; Tlx : 0343-  
286 SSP IN.

## EVAPORATIVE CON- DENSER

North Star Ice Equipment Co.  
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31 Erandwane, Pune 411 004. Tel  
: 340973, 348241. Fax : 0212-  
348241.

## EXTRUDERS, SNACKS/ VERMICELLI

Dr. T.K. Food Consultants &  
Exporters -- See under  
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Fabdecon Engineers -- See un-  
der "Agitators".

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Equipment".

Fabdecon Engineers -- See un-  
der "Agitators"

Food Tech Engineers-- See un-  
der "Machinery, Food & Beverage  
Processing"

Frigmaires Engineers -- See  
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Techno Equipment -- See un-  
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## FILLING MACHINES, AERATED WATER/SYRUP

Autopack Machines Pvt. Ltd. -  
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## FILLING MACHINE, BAG/ POUCH

Sellal, "Geetanjali," 9 Deccan  
College Rd., Pune 411 006. Tel :  
668369/610113

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Bombay Engineering Industry -  
-- See under "Filling Machines,  
Powder/Granules"

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-- See under "Filling Machines,  
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Sellal -- See under "Filling Ma-  
chines, Bag/Pouch"

## FILLING MACHINES, POWDER/GRANULES

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Bombay Engineering Industry,  
Rm. No. 6 (Extn). Sevantibai  
Bhavan, Chimatpada, Marol Naka,  
Andheri (E), Bombay 400 059. Tel  
: 8369368, 8215795. Fax : 91-22-  
8327448.

Noble Polymech -- See under  
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Sellal -- See under "Filling Ma-  
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Food Tech Engineers-- See un-  
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Frigmaires Engineers -- See  
under "Agitators".

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Manufacturers -- See under "Emul-  
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New Indo International (Regd.)  
-- See under "Pillowpack Packing  
Machines".

Recon Machine Tools Pvt. Ltd.,  
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ing"

Petrox Private Ltd. -- See un-  
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-- See under "Biscuit Packing Ma-  
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009. Tel: 461020, 423940, 406766.  
Fax: 91-79-463444.

## FILTERS

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der "Machinery, Food & Beverage  
Processing"

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Chemicals Pvt. Ltd., 230/4 Ashoka

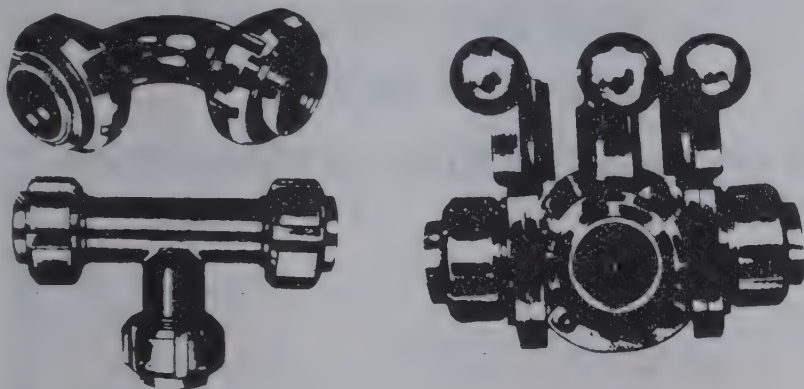




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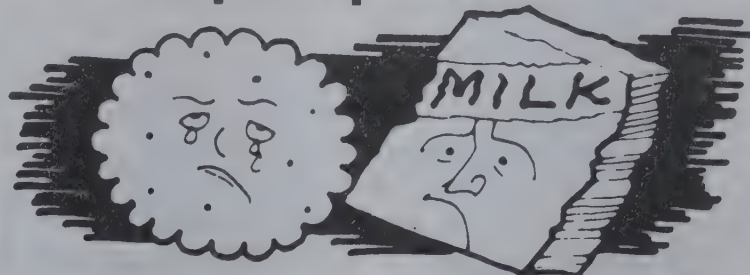
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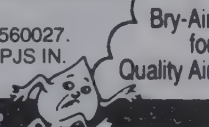
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Otoklin, Plot No. 1, Shah. Indl. Area, V. Desai Rd., Andheri (W), Bombay 400 058. Tel: 6267476.

Sharplex Agro Process (I) Pvt. Ltd., 302 Hill View, Ind. Est., LBS Marg, Ghatkhopar (W), Bombay 400 086. Tel : 5172606, 5172108, 5173808. Fax : 91-22-517 1239.

## FILTERS, WATER

Hitech Ultraviolet Pvt. Ltd. -- See under "U.V. Water Disinfectant System"

## FILTER CLOTH/FABRIC

Thor Systems -- See under "Air/Dust/Fume Control"

## FILTER HOUSINGS/CARTRIDGES

Ace Marketing Company, 222 Shah & Nahar (A2), Lower Parel, Bombay 400 013. Tel : 4944942, 49459547. Fax : 91-22-49 54250.

## FILTER PAPER

Lab Instruments -- See under "Heating Mantles".

Blinex -- See under "Air Filters"

Sharplex Agro Process (I) Pvt. Ltd. -- See under "Filters"

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Brito-matics, C-9 Nand Dham Indl. Estate, Marol Maroshi Rd., Marol. Andheri (E), Bombay 400 059. Tel : 8379833-8379834. Fax : 91-22-8375699.

Kumar Process Consultants & Chemicals Pvt. Ltd. -- See under "Filters".

Paramount Consultants -- See under "Effluent Treatment Plants"

Pharmaco Machines -- See under "Bottle Washers & Rinsers"

## FISH PROCESSING PLANT

Industrial Refrigeration -- See under "IQF Spiral Freezing"

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## FLAKING MACHINERY, RICE

Durai Industrial Works -- See under "De-Stoners"

## FLAVOURS, DUSTING

M.C. Davar Aromatics Ltd.--

See under "Essences & Flavours"

## FLAVOURING EMULSIONS

Duckworth Flavours (India) Pvt. Ltd., Aleems Manor, No. 2, 100 Feet Ring Road, IV Phase, J.P. Nagar, Bangalore 560 078. Tel : 6645401, 6646135. Fax: 91-80-6646135.

M.C. Davar Aromatics Pvt. Ltd. -- See under "Essences & Flavours".

Sri Krupa Flavours Pvt. Ltd., APHB, HIG II, Block 6, Flat 7, Bagh Lingampally, Hyderabad 500 044. Tel: 669038. Gr: SRI KRUPA.

## FLAVOURING ESSENCES

Feroze Foods & Flavours, 403 Central Tin Estate, D.K. Marg, Sussex Road, Byculla, Bombay 400 027. Tel: 3729724, 3614972.

M.C. Davar Aromatics Pvt. Ltd. -- See under "Essences & Flavours".

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## FLOW METER

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## FLUID BED DRYERS

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Pharmaco Machines, Ground Flr., Pandit House, Behind Nagrik Stores, Station Road, Thane 400 601. Tel: 5332245/5463722. Fax: 91-22-5331084.

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L.B. Aroma & Chemicals -- See under "Essential Oils".

Narmada Food Colours Pvt. Ltd., 56/58 Garibdas Street, Vadgadi, Bombay 400 003. Tel : 3424162/63. Fax : 91-22-3432854.

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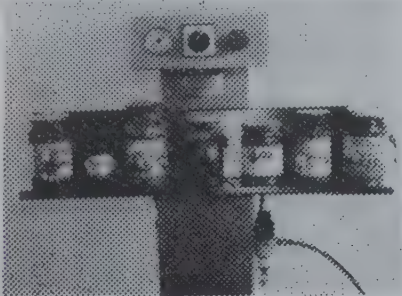
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Oror Flavours & Chemicals Pvt. Ltd., Subbiah Naidu Industrial Complex, Arumbanoor Post, 4 Pudupatti, Madurai North 625 107. Tel: 0452-832736. Tlx: 0445-310 SSPIN Fax: 91-452-832824. Gram: SPICES.

Universal Food Flavours -- See under "Dusting Flavours"

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BEC Foods. 31 Maker Chambers III, 3rd Flr., Nariman Pt., Bombay 400 021. Tel 2043647, 2831724, 2871331, Tlx : 011-84054 BECO IN, Fax : 022-2873611.

Cantech Machines -- See under "Can Closing & Seaming Machine".

Continental Equipment India Pvt. Ltd. -- See under "Bakery/Biscuit Equipment".

Durai Industrial Works -- See under "De-Stoners"

Fabdecon Engineers -- See under "Agitators".

Filtron Engineers Ltd. -- See under "Dairy Plant & Equipment"

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing"

Geeta Food Engineering, Ashirwad Complex, Vashi Village, Opp. Starling Hospital, Gala No. 2, New Bombay 400 703. Tel: 022-7667069. Fax: 91-22-7662098.

Goma Engineering Pvt. Ltd.-- See under "Beverage Processing Machinery"

Hi-Tech Systems, 80, Hardwar Road, Dehradun 248 005. Delhi Office: C-9B, Gangotri Enclave, Alakhnanda, Kalkaji, New Delhi 110 019. H.O. 25853 D.O. : 6436772. Gr: ATMA.

Industrial Refrigeration -- See under "IQF Spiral Freezer".

New Indo International -- See under "Pillow Pack Packing Machines".

M.F. Marketing, B-104 Arjun Centre, B.S. Devshi Marg, Govandi 400 088. Tel : 5560947/ 5557515. Gr: STEAMSET. Fax : 91-22-5560569.

Metal Plants -- See under "Contra-Rotary Mixers".

'METACOLOR', Shree Precoated Steel Ltd.-- See under "Refrigeration Equipment & Plant".

S.J. Roy, B-59 Defence Colony, New Delhi 110 024. Tel: (011) 4694689, 4623224. Fax: (011) 4623224.

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants / Projects".

Santosh Engineering & Fabricators -- See under "Boilers".

Techno Equipments, Saraswati Sadan, 31 Parekh St., Bombay 400 004. Tel: 3851258, 5515640. Gram: FOODEQUIP, Bombay 4.

Tricon Food Machinery Co., 5A Mayur, Off Bhayandar Rd., 771 Deccan Gymkhana, Pune 411 004. Tel: (0212) 342203, 344607, 342451. Fax: (0212) 342451.

Vamp Engineers Pvt. Ltd., 203 Rajguru Apts., New Nagardas Rd., Andheri (E). Bombay 400 069. Tel: 8380548/8384173. Fax : 91-22-8390195.

Varun Industries, Opp. Portuguese Church (W), Bombay 400 028. Tel: 4304850/4229400. Fax: 022-4362283.

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Autopack Machines Pvt. Ltd. -

- See under "Bottle Filling & Sealing Machines"

Gansons Engineers Pvt. Ltd., 118/121 Swastik Chambers, Off. Sion Trombay Rd., Chembur, Bombay 400 071. Tel: 524548/ 524967.

Grip Engineers, 7/8, Meghwadi Naka, Opp. Maratha Mandir Co-op. Bank, Megh Wadi, Jogeshwari (East) Bombay 400 060. Tel : 645 5103/6455079.

New Indo International (Regd.) -- See under "Pillow Pack Packing Machines".

Rajhans Enterprise, No. 101 Sai Deep Shopping Centre, Chembur Govandi Rd., Opp. Vaishali Hotel, Chembur (West), Bombay 400 071. Tel: 5557574. Fax: 5160769.

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machines".

Unique Flexo Packaging-- See under "Filling & Sealing Machines"

## **FREEZERS**

C.M. Equipments & Instruments (I) Pvt. Ltd. See under "Agitators"

Consolidated Services -- See under "Kitchen Equipment".

General Air Conditioning Co. - See under "Cold Storage Plant/ Equipment"

Industrial Refrigeration -- See under "IQF Spiral Freezers"

## **FRIERS, FOOD**

Ross Thermal Systems Pvt. Ltd. -- See under "Steam Boilers"

## **FRUIT CRUSHER**

Techno Equipments -- See under "Food Processing Equipment/ Plants".

## **FRUIT JUICE BOTTLING PLANT**

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants/ Projects".

## **FRUIT VEGETABLE PROCESSING PLANT/ MACHINERY**

Eastend Engineering Co., 173/ 1 Gopal Lal Thakur Rd., Calcutta 700 035. Tel: 526324, 523416.

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

Industrial Refrigeration -- See under "IQF Spiral Freezers"

Magumps -- See under "Bottle Filling & Sealing Machines"



Orbit International Technologies Pvt. Ltd. -- See under "Machinery, Potato Processing"

SSP Pvt. Ltd., 13 Mile Stone, Faridabad 121 003. Tel : 0129-277442/275968/277730. Fax : 0129-277441/011-6847665.

Sangram Engineering Pvt. Ltd. -- See under "Turnkey Plants/Projects"

Synergy Agro-tech (P) Ltd. -- See under "Airconditioning/Refrigeration Plant/Equipment"

Techno Equipments -- See under "Food Processing Equipment/Plant"

## FUMARIC ACID

Amit Fine Chem -- See under "Agar Agar (Powder/Strips)"

Olin Chemicals -- See under "Acetic Acids".

## GAS/OIL BURNERS

Classic Enterprises, 101 Jehangir Mansion, Cinema Rd., Behind Metro, Bombay 400 020. Tel: 2088291, 2058916. Fax: 91-22-2080404.

## GAS DISPENSING MACHINE

Packera. 34 Kokate Bldg., Bhosalenagar, Pune 411 007. Tel: 0212-327209.

## GAS PLANTS, NITROGEN

MVS Engineers Co. -- See under "Air Dryers"

## GELATINE

Amit Fine Chem -- See under "Agar Agar (Powder/Strips)".

Kiran Kotak & Co., 414/418 M.J. Phule Market (Crawford Market), Bombay 400 001. Tel : 3429580, 3442796. Fax : 3429580.

## GHEE FILTRATION UNITS

Codex Enterprises -- See under "Batch Coder".

## GLASS & GLASSWARES

R.G. Glass Agency -- See under "Bottles & Jars, Glass".

## GLASS FABRICS, PTFE COATED

Unnati Corporation -- See under "Adhesive Tapes, PTFE, Glass".

## GLUCOSE, LIQUID

See also "Liquid Glucose"

Amruth Starch Private Ltd., Morampudi Post, Hukempeta,

Rajahmundry 533103. Tel : 61106.

The Sukhjit Starch & Chemicals Ltd. -- See under "Starch"

## GRAINS & CEREALS CLEANING/GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd. 315, Race Course Towers, Race Course Circle, Baroda - 390 015. Tel: (0265) 340597. Fax: (0265) 338150.

Goldin (India) Equipment Pvt. Ltd. 1st fl., Saraswati Industrial Estate, Opp. Chhani Jakat Naka, Vadodara 390 002. Tel: (0265) 481452. Fax: (0265) 481452.

Shirke Structurals Pvt. Ltd. -- See under "Silo Storage Systems"

## GRAVITY SEPARATOR

Forsberg Agritech (India) Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery"

John Fowler (India) Limited, Sarjapur Road, Bangalore 560 034. Tel: 5530026. Fax: 91-08-5533228. Tlx: 08452545.

## GRINDER, WET & DRY

New Canara General Stores, 178 Dr. Babasaheb Ambedkar Rd., Byculia, Bombay 400 027. Tel : 3722031.

Sesa Pulverisers, Kala Kila Road, Dharavi, Bombay 400 017. Tel: 4121434.

## GRINDING MILLS

Frigmaires Engineers -- See under "Agitators".

Sesa Pulverisers -- See under "Grinder, Wet & Dry".

## GUAR GUM

Ace International, 13/21, Laura Bldg., 1st Floor, Office No. 5B, 1st Dhobi Talao Lane, Bombay 400 002. Tel: (O) 2001413/2008169. Fax: 91-22-2093240. Tlx: 011-86654 PCOK IN.

Alok Chem Corporation, 406, Goradia House, P.O. Box No. 13048, 100/104, Kazi Syed Street, Bombay 400 003. Tel: 3426390/5365. Res: 5648355. Fax: 91-22-3426390.

Indian Gum Industries Ltd., 15-A, Maker Chamber IV, Nariman Pt., Bombay 400 021. Tel : (022) 2852075, 76, 77. Fax : 0091-22-2040393. Tlx: (011) 82139 IGUM, 83248 IGIL

Kapadia Gumchem Industries, 3, Mint Road, 2nd Floor, Room No. 30, Opp. G.P.O. Box No. 1160, Bombay 400 001. Tel: 2615073/2617217. Gram: PHARMAGUM. Fax: 91-22-2619423.

Swastik Gum Industries (India) 328 G.V.M.M. Vasahat, Odhav, Ahmedabad 382415. Tel: 870063/870064/870065. Tlx: 011-73265 KATR IN (Bombay).

## GUAR GUM POWDER

Ace International -- See under "Guar Gum".

Indian Gum Industries Ltd. -- See under "Guar Gum"

Kapadia Gumchem Industries -- See under "Guar Gum".

Shree Ram Gum & Chemicals, C-79 MIA, II Phase, Basni, Jodhpur 342 005.

## GUM ACACIA

See also "Acacia Gum".

Ace International -- See under "Guar Gum".

Alok Chem Corpn. -- See under "Guar Gum".

Drytech Processes (I) Pvt. Ltd., B-16 Girikunj Indl. Estate, Mahakali Caves Rd., Andheri (E), Bombay 400 093. Tel: 8378915/8326494/8301918/8210401. Fax: 022-8367442, 8364753.

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Alok Chem Corp -- See under "Guar Gum".

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Drytech Processes (I) Pvt. Ltd. -- See under "Acacia Gum".

Kapadia Gumchem Industries, -- See under "Guar Gum".

Kushalchand Sons, Devkaran Mansion, Block No. 1, 2nd Floor, 79 Princess Street, Bombay 400 002. Tel: 205 2190/2080937. Fax: 91-22-2084265.

## GUM BOILING PANS

Cosywo Engineering Company -- See under "Chemical Plant & Equipment".

## GUM GHATTI

Ace International -- See under "Guar Gum".

Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

## GUM KARAYA

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Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

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Burzin and Leons Agenturen Pvt. Ltd. -- See under "Additives, Food & Beverage".

Drytech Processes (I) Pvt. Ltd. -- See under "Gum Acacia".

Great Blends, 5/1 Fourth Main Rd., Jayanagar Extn., Mysore 570014. Tel : 080-26990.

IDL Arom International Ltd., Nirmal, 15th fl., Nariman Pt., Bombay 400 021. Tel: (91) 22-2026946/2025318/2041267, Fax: (91) 22-2041187, Tlx: 011-82539 IDLB IN.

Indian Gum Industries Ltd. -- See under "Guar Gum".

Kapadia Gumchem Industries -- See under "Guar Gum".

Olin Chemicals -- See under "Acetic Acid".

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Waterproof Corporation Pvt. Ltd. -- See under "Gummed Paper Tape".

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## HEAT EXCHANGERS

Arctic India Sales -- See under "Dehumidifiers".

Excelsior Engineers -- See under "Cooling Towers".

Food Tech Engineers -- See under "Machinery, Food & Beverage Processing".

Praj Industries Ltd., Process Equipment & Systems Div., 103 & 203 Erandwane Indl. Area, Off Karve Rd., Opp. SNDT College, Pune 411 038. Tel : +91-212-361013. Fax : +91-212-363039.

## HEATING ELEMENTS

Subhash Gupta & Co., A-45 Nand Gram, Meerut Rd., Ghaziabad 201 003. Tel: (0575) 8-733866. Fax: (011) 2293795.

## HEATING MANTLES

Lab Instruments, Ratnadeep, 1st Floor, 78, B. Jaganath Shankar Seth Rd., Behind Panchratna, Near Roxy, Opera House, Bombay 400 004. Tel: 3610973. Fax: 3634619.

Manikant Bros. -- See under "Anti-Corrosion Chemicals".

Subhash Gupta & Co. -- See under "Heating Elements".

Thermal Instruments & Equipments -- See under "Dairy Laboratory Equipments".

## HERBS

Rupande Food Products, 52 Shivajinagar, N.M. Joshi Marg, Lower Parel (E), Bombay 400 013. Tel : 306 0357.

## HOMOGENIZERS

Cosywo Engineering Co. -- See under "Chemical Plant & Equipment".

Dairy Den (India) Pvt. Ltd., 25 Madhuvan, Ellisbridge, Ahmedabad 380 006. Tel : 461205/449538. Fax : 079-443537. Tlx : 0121-7157 DDPL IN.

Dairymac Engineering Pvt. Ltd. -- See under "Dispensers, Beverages".

Fibre & Fibre Products -- See under "Stirrers".

Filtron Engineers Ltd. -- See under "Dairy Plant & Equipment".

Frigmaires Engineers -- See under "Agitators".

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

Indrayani Agro Industries Pvt. Ltd., D-56 MIDC Additional Industrial Estate, Ambad, Nasik 422010. Tel : 382483. Fax : 381267.

J. T. Jagtiani -- See under "Machinery, Food & Beverage Processing".

Mamko Process Equipment Manufacturers -- See under "Emulsifiers".

Synergy Agro-tech (P) Ltd. -- See under "Airconditioning/Refrigeration Plant/Equipment".

## HOT WATER GENERATORS

Ross Thermal Systems Pvt. Ltd. -- See under "Steam Boilers".

## HUMIDIFIERS

Arctic India Sales -- See under "Dehumidifiers".

C.M. Equipments & Instruments (I) Pvt. Ltd. -- See under "Agitators".

## HYDROMETERS

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers".

## HYGROMETERS

Industrial Instruments Co. -- See under "Temperature Indicators/Controllers".

## ICE CUBE MACHINE

Dairy Den (India) Pvt. Ltd. -- See under "Homogenizers".

Multifrig Marketing Co. (P) Ltd. -- See under "Cooling Cabinets".

## ICE MAKING MACHINERY

Industrial Refrigeration, 9th Fl., Maker Chambers, V. Nariman Point, Bombay 400 021. Tel: 2041183, 85, 89, 2872363, 2872379. Gram: KOOLFAST. Tlx: 011-84130 RUIA IN/ 011-84275 INCO IN. Fax: (91-22) 2044944.

Snowball Enterprises, Shop No. 44, Panchratna, Gr. Fl., Opera House, Bombay 400 004. Tel: 3640335. Fax: 91-22-3614863.

## ICE CREAM CONE MACHINES

Gemini Engineers, 12-B Shama Apartments, 138/1, P.G. Road, Secunderabad 500 003. Fax: 0091-040-84882.

R & D Engineers, A-41/1, I.D.A. Kukatpally, Phase II, Road No. 4, Hyderabad 500 037. Tel: 040-279121/279878. Fax: (040) 278668.

## ICE CREAM MAKING MACHINES

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery".

The Panchal Workshop, P.B. No. 62, Anand Sojitra Rd., Anand 388 001. Tel: (02692) 34332, 34399. Tlx: 0172-251 VUIA IN. Fax: (02692) 34332/46454.

Synergy Agro-tech (P) Ltd. -- See under "Air conditioning/Refrigeration Plant/Equipment".

## IDLI MACHINES/PLANTS

Sri Rajalakshmi Commercial Kitchen Equipment P. Ltd. -- See under "Deep Fat Fryers".

## IMPROVERS

Davars M.P. Organics -- See under "Emulsifiers, Food".

## IMPULSE SEALERS

N.S. International, 18 Venus

Apt., Navghar Road, Bhayander (E), Bombay 401105. Tel: 8193005.

Sarlech Electro Systems, 14462/1 Bhagwan Nagar, Near Savitri, Complex, G.T. Rd., Ludhiana 141003. Tel : 531444; Gram : SARLEHEAT. Tlx : 0386-384 PSIC-IN-ATTN. Fax : 091-161-532871.

Shubhada Enterprises, 2991, 1st Fl., Mahakavi Kuvempu Rd., Mariyappana Palya, Bangalore 560 021. Tel : 325 734.

Swastik Packaging, 4 Dev Sadan, Chimatpada, Behind Hotel Ruby, Marol Naka, Andheri (E), Bombay 400 059. Tel: 8324673, 8341340. Fax: 91-22-8388198.

## INCUBATORS

C.M. Equipments & Instruments (I) Pvt. Ltd. -- See under "Agitators".

## INDUSTRIAL GAS MONITORS

Subtronics, Kaliandas Udyog Bhavan, Unit No. 147, Near Prabhadevi H.P.O. Bombay 400 025. Tel: 4224461/4303047

## INDUSTRIAL HEATERS

Subhash Gupta & Co. -- See under "Heating Elements".

## INSECTICIDES

Ultima Search, Excel Estate, S. V. Road, Goregaon (W), Bombay 400 062. Tel: 8751618, 8724174.

## INSECT KILLERS (Insectocutors, Electric)

Opel Industries -- See under "Fly Killers, Electric".

Pest Control (India) Ltd. -- See under "Air Curtains".

Varun Industries, Opp. Portuguese Church, Dadar (West), Bombay 400 028. Tel : 4304850. Fax : 4362283

## INSTRUMENTS, INDUSTRIAL AND PROCESS CONTROL

Lab-Instruments -- See under "Heating Mantles".

Tata Honeywell Limited -- See under "Controllers, Flow, Label, Temp. etc.

## INSTRUMENTS, TESTING

Ion Exchange (India) Ltd. -- See under "Water Treatment Plants/Equipment".



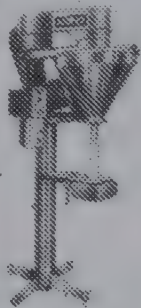
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- Power input 0.75 kw.



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## CREAM FILLER MODEL C.F.-30

Filling machine for creams, grease adhesives, lotions, balms, gums etc. in pouches or containers.

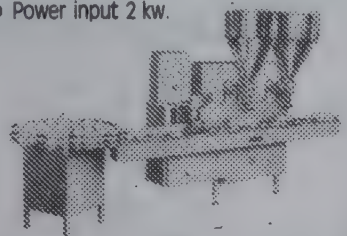
- Output upto 2000 containers/hr.
- Power input 0.75 kw.



## AUTOMATIC CREAM FILLING MACHINE MODEL C.F.-70

For filling of grease, adhesives, creams, lotions, balms, gums etc. in rigid containers.

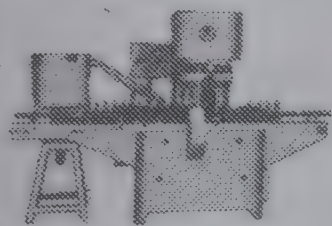
- Output upto 4500 containers/hr.
- Power input 2 kw.



## AUTOMATIC ROTARY CAPPING MACHINE MODEL A.C.-6

Rotary capper for automatic capping of prethreaded plastic caps on to bottles of different shapes and sizes.

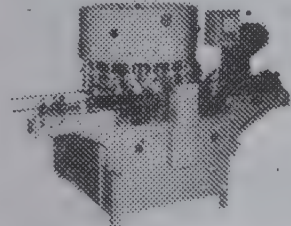
- Output upto 120 bottles/min



## AUTOMATIC ROTARY SEALING MACHINE MODEL R.S.-16

Automatic Rotary Sealing machine for plastic inserts/plug onto HDPE/LDPE bottles.

- Output 120 bottles/min



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Automatic wrapping machine for overwrapping rectangular cartons with B.O.P.P./Cellophane like tooth brush carton, cassettes & blade carton etc.

- Output upto 120 cartons/min



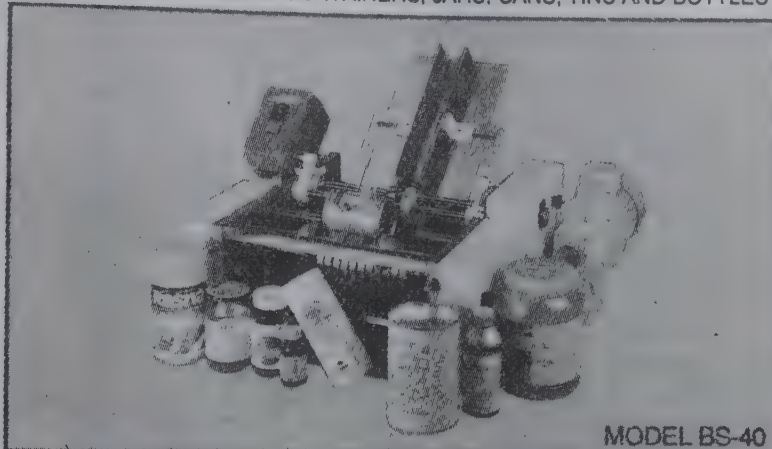
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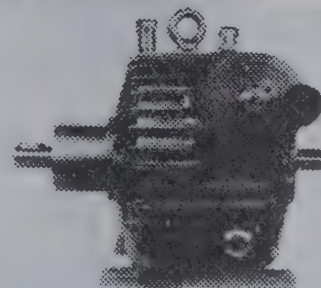
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Geeta Food Engineering -- See  
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Techno Equipments -- See un-  
der "Food Processing Equipment/  
Plant".

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See also under "Steam  
Jacketted Kettles"

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cuit Equipment".

Food Tech Engineers -- See un-  
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Geeta Food Engineering -- See  
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ment/Plant".

Techno Equipments -- See un-  
der "Food Processing Equipment/  
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## KITCHEN EQUIPMENT

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Escee Kitchenaid, "Shreeniwas  
House", 98 Dattaram Lad Marg,  
Bombay 400 003. Tel: 4114485,  
4136393, 4135982. Cable:  
KITCHENTOP. Tlx: 011-3920.  
Fax: 3780960.

Frigmaires Engineers --See un-  
der "Agitators".

Kitchen Udyog, 112 Reshab  
Shree House, Commercial Com-  
plex, New Delhi 110008. Tel: 570  
3616.

New Canara General Stores,  
178 Dr. Babasaheb Ambedkar Rd.,  
Byculla, Bombay 400 027. Tel :  
3722031.

Sri Rajalakshmi Commercial  
Kitchen Equipment Pvt. Ltd. -- See  
under "Deep Fat Fryers"

Vipul Engineering Equipment,  
13th Girish Kunj, Rd., No. 3, Juhu  
Scheme, Vile Parle (W), Bombay  
400 056. Tel: 6145100, 8080692.  
Fax: 022-4943409.

## KITCHEN FOIL

Foil Impex (Bombay) Pvt. Ltd.,  
66 Bharat Mahal, 86 Marine Drive,  
Bombay 400 002. Tel : 91-22-  
2017202/2011401. Fax : 91-22-  
4950467.

## KNEADERS

Fabdecon Engineers -- See un-  
der "Agitators".

Frigmaires Engineers -- See un-  
der "Agitators".

Vipul Engineering Equipment  
-- See under "Kitchen Equipment".

## LPG BOTTLING PLANT

Globe Gas Equipments Indus-  
try Pvt. Ltd. -- See under "Burn-  
ers/Fittings, Commercial"

## LABELLING MACHINES

Ambica Labelling Pvt. Ltd.,  
Plot No. A/2 Phase II, GIDC,  
Vatva, Ahmedabad 382 445. Tel :  
5831346/5830153. Fax: 079-  
5835885.

Bhavani Pattern Works, Plot  
No. 2, Phase II, GIDC, Vatva,  
Ahmedabad 382445. Tel :  
5831346. Fax: 079-5835885.

Excel-Techno Engineers Pri-  
vate Ltd., 27 Stadium House,  
Navrangpura, Ahmedabad 380  
009. Tel : 079-6427866. Fax : 079-  
6427866.

Lab Instruments -- See under  
"Heating Mantles".

Maharshi Udyog, 4 Ruchi, 36  
Swastik Society, Navrangpura,  
Ahmedabad 380 099. Tel: 409183/  
452456. Fax: 0272-425456.

Wonderpack Industries (P) Ltd.  
-- See under "Biscuit Packing Ma-  
chinery"

## LABEL GUMMING MACHINE

Pharma Machines -- See under  
"Bottle Washers & Rinsers"

## LABEL PRINTING MACHINE

Codex Enterprises -- See un-  
der "Batch Coder".

Gopal Engineering Works, Part

2/5 Kailash Ind. Estate, Behind  
C.M.C. Odhav, Ahmedabad 382  
415. Tel : (079) 2874969.

Jacsons Engineers, Phase 4,  
Plot No. 4701, G.I.D.C. Ind. Es-  
tate, Vatva, Ahmedabad 382 445.  
Tel: 830156. Gram : JALDEEP.  
Fax: 91-079-833408.

## LABORATORY EQUIPMENT

C.M. Equipments & Instru-  
ments (I) Pvt. Ltd. -- See under  
"Agitators"

Lab Instruments -- See under  
"Heating Mantles".

## LABORATORY, TESTING

Bangalore Test House, 65, 20th  
Main, Marenhalli, Vijaynagar,  
Bangalore 560 040. Tel: 3356415,  
Gram: TEST HOUSE.

## LACTIC ACID

Balaji Dye Chem -- See under  
"Additives, Food & Beverage".

Indus Chemie, 174 Samrat  
Bhavan, Rm. No. 3, Gujarat Soci-  
ety, Sion (W), Bombay 400 022.  
Tel: 4071318/4071346. Fax : 022-  
4092718.

Lactochem Ltd., 18 Venu  
Reddy St., Guindy, Madras 900  
032. Tel: 044-234-789. Gr:  
LACTOCHEM. Fax: 044-  
2343857.

Sesu Trading Corp -- See un-  
der "Acids".

## LACTOSE

Kushalchand Sons -- See under  
"Gum Arabic"

## LAMINATED PACKAGING FILM

Samarpan Converters Ltd. --  
Plot No. -182/A-183, Rd. 16/2,  
Wagle Indl. Estate, Thane 400 604.  
Tel: 5321842, 5320822, 5320029.  
Fax: 91-22-532033.



## **LEADER LINE CONTROLLER**

Tata Honeywell, 55-A/8, 9  
Hadapsar Indl. Est., Pune 411 013.  
Tel : 670445, 675532. Fax: 212-  
675992/672205.

## **LEMON OIL**

Aroma Impex -- See under "Ar-  
omatic Chemicals".

Hitashi Chemical -- See under  
"Aromatic Chemicals".

Olin Chemicals -- See under  
"Acetic Acid".

Vidarbha Fruit Products Co.  
Pvt. Ltd.-- See under "Calcium Ci-  
trate"

## **LIME OIL**

Aditi Pectins Pvt. Ltd. -- See  
under "Pectin"

Hitashi Chemicals -- See under  
"Aromatic Chemicals".

Olin Chemicals -- See under  
"Acetic Acid".

Vidarbha Fruit Products Co.  
Pvt. Ltd. -- See under "Calcium  
Citrate"

## **LIPIDS, FOOD**

Vidarbha Fruit Products Co.  
Pvt. Ltd. -- See under "Calcium  
Citrate"

## **LIQUID GLUCOSE**

Vertex Chemicals, 301-B, Her-  
itage House, Gundavli Cross Rd.,  
No. 2, Andheri East, Bombay 400  
069. Tel/Fax: 8218004.

## **LIQUOR FLAVOURS**

Oror Flavours & Chemicals Pvt.  
Ltd. -- See under "Food Flavours".

## **LOCUS BEAN GUM**

Kushanchand Sons -- See un-  
der "Gum Arabic"

## **LUBRICANTS**

Acme Synthetic Chemicals --  
See under "Distillation Columns"

## **LUG CAPS**

Larsen & Toubro Ltd., (Pack-  
aging Div.)-- See under "Bottle  
Caps & Closures"

## **LUG CAP SEALING MACHINE**

Raj Products & Equipment,  
P.O. Box 8075, Bombay 400 056.  
Tel: 8192250, 8192750. Res:  
6102035, Fax: 8375628.

## **MACHINERY, BLISTER PACKAGING**

Sarlech Electro Systems -- See  
under "Impulse Sealers"

Samarpan Fabricators Ltd. --  
See under "Filling & Sealing Ma-  
chinery"

## **MACHINERY, BREAD/ BISCUIT**

Prima Engg. Industries -- See  
under "Bakery /Biscuit Equip-  
ment"

## **MACHINERY, CONFECTIONERY**

Continental Equipment India  
Pvt. Ltd. -- See under "Bakery/Bis-  
cuit Equipment".

Fabdecon Engineers -- See un-  
der "Agitators".

Frigmaires Engineers -- See  
under "Agitators".

## **MACHINERY, DAIRY PROCESSING**

See also under "Dairy Plant  
& Equipment"

Fabdecon Engineers -- See  
under "Agitators".

## **MACHINERY, FOOD & BEVERAGE PROCESSING** See also "Food Processing Machinery/Equipment".

Bombay Industrial Engineers,  
430 Hind Rajasthan Centre, D.S.  
Phalke Rd., Dadar (C. Rly.),  
Bombay 400 014. Tel : 411 3999/  
4114275. Gr: BOMBING,  
Bombay 14.

Consolidated Services -- See  
under "Kitchen Equipment"

Ducon Equipments Private Ltd.  
-- See under "Consultancy & De-  
sign"

Food Tech Engineers, 31A,  
Ghanshyam Ind. Estate, Veera  
Desai Road, Andheri (West),  
Bombay 400 058. Tel: 6269106,  
6234718. Fax: 91-22-6267298/  
6269106.

J.T. Jagtiani, National House,  
Tulloch Road, Apollo Bunder,  
Bombay 400 039. Tel: 2020028/  
2021433.

Sangram Engineering Ltd., B-  
5 Supercon, Opp. ITI, Aundh, Pune  
411007. Tel : 366935, 342302. Fax  
: 349673.

Vamp Engineers Pvt. Ltd., 203  
Rajguru Apts., New Nagardas Rd.,  
Andheri (E), Bombay 400 069. Tel  
: 91-22-8390195.

## **MACHINERY, LABELLING**

Excel Techno Engineers Private  
Ltd., 27 Stadium House, Navrang-  
pura, Ahmedabad 380 009. Tel:  
079-6427866, Fax: 079-6427886.

## **MACHINERY, MEAT PROCESSING**

Food Tech Engineers -- See  
under "Machinery, Food & Bever-  
age Processing"

Orbit International Technolo-  
gies Pvt. Ltd. -- See under "Ma-  
chinery, Potato Processing"

## **MACHINERY, PACKAGING**

A.M.P. Rose (P) Ltd., 38 Dou-  
ble Road, K.H. Rd., Bangalore 560  
027. Tel : +91 (0) 2226227,  
2216514. Fax : 91-(0) 80-2216165.

Aarkay Wrapping Machines  
Pvt. Ltd., 1, Hormuzd, 131, August  
Kranti Marg, Bombay 400 036.  
Tel: 3670537, 367-5277. Fax : 91-  
22-3670217. Gram:  
CRAFTWORLD.

Autopack Machines Pvt. Ltd. -  
- See under "Bottle Filling & Seal-  
ing Machines"

Frigmaires Engineers -- See un-  
der "Agitators".

Kavacha Engineering, 33, E.C.  
Extn., Kushaiguda, Hyderabad 500  
762. Tel: 623665/863995. Fax:  
620892.

M.K. Agencies, 275/279, Shriji  
Bhavan, 1st Floor, Samuel Street,  
Vadgadi, Bombay 400 003. Tel :  
3437520, 3413308.

Noble Polymech Corporation,  
W-102 MIDC, Phase 2, Dombivli  
421204, Bombay 421204. Tel :  
470453. Fax : (0251) 470453.

Pakona Engineers (India) Pvt.  
Ltd., 22-D, Wadia Charities Bldg.,  
2nd Floor, S.A. Brelvi Street, Fort,  
Bombay 400 023. Tel: 2872181/  
2874642.

R.G.K. Enterprises, Madhu  
Kunj, Vinod Baug, Juhu-Line,  
Block No. 12, Ground Floor,  
Andheri (W), Bombay 400 058.

Rathi Industrial Equipment Co.  
Ltd. -- See under "Size Reduction  
Equipment"

Recon Machine Tools Pvt. Ltd.,  
37 Sarvoday Indl. Estate, Mahakali  
Caves Rd., Andheri (E), Bombay  
400 093. Tel: 834973, 8343913.  
Fax : 022-8361074.

Sarlech Electro Systems -- See  
under "Impulse Sealers"

Samarpan Fabricators Ltd. --  
See under "Filling & Sealing Ma-  
chinery"

Selall -- See under "Filling  
Machinery, Bag/Pouch"

Sil & Pack Industries, 30 Laxmi  
Ind. Estate, New Link Rd., Andheri  
(W), Bombay 400 058. Tel : (022)  
6266535. Fax : 91-22-6266535.

Stela Impex, C-9 Sector 2,  
Noida 201 301. Tel: 011-8927971.  
Fax: 011-23104.

St. Joseph Engg. Works, 216/  
304 - A Manish Commercial Cen-  
tre, 3rd Fl., Next to Century Bazar,  
Dr. A.B. Rd., Worli, Bombay 400  
025. Tel: 4932653, 3076541.

Tinmaco Engg. Co. (Bombay)  
Pvt. Ltd.-- See under "Tin Can  
Machinery Machine"

Unique Flexo Packaging -- See  
under "Automatic Form-Fill-Seal  
machines".

W.R. Grace & Co. (India) Pvt.  
Ltd. -- See under "Packing Materi-  
als"

Waterproof Corporation Pvt.  
Ltd. -- See under "Case Sealing  
Systems"

Wonderpack Industries (P) Ltd.  
-- See under "Bread/Biscuit Pack-  
ing Machinery"

## **MACHINERY, PACKAGING FLEXIBLE**

Chinoy Electronics -- See un-  
der "Standipouch Machinery"

## **MACHINERY, POTATO CHIP/WAFERS**

Sri Rajalakshmi Commercial  
Kitchen Equipment P. Ltd. -- See  
under "Deep Fat Fryers"

## **MACHINERY, POTATO PROCESSING**

Orbit International Technolo-  
gies Pvt. Ltd. 404 Taramandal  
Complex Secretariat Rd.,  
Hyderabad 500 004. Tel : 241216/  
597798. Fax: (040) 599068.

## **MACHINERY, SHRINK WRAPPING**

See also "Shrink/Skin Wrap-  
ping Packaging Machines"

Sarlech Electro Systems -- See  
under "Impulse Sealers"

Samarpan Fabricators Ltd. --  
See under "Filling & Sealing Ma-  
chinery"

Wonderpack Industries (P) Ltd.  
-- See under "Biscuit Packing Ma-  
chinery"

## **MACHINERY, SOFT DRINKS**

Goma Engineering Pvt. Ltd.--  
See under "Beverage Processing  
Machinery"

## **MACHINERY, TEA PROCESSING**

Steelsworth Ltd., Circular  
Court, 8 A.J.C. Bose Rd., Calcutta  
700 017. Tel (033) 2470238/  
2470165. Fax : (033) 2472649. Tlx



## MACHINERY, TOMATO PROCESSING

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

## MAGNETIC SEPARATORS

Perfect Magnets Pvt. Ltd.,  
14 /1 Vishwabharti Co-op. Hsg. Society, Akshay Bldg., V.P. Rd., Andheri (W), Bombay 400 058. Tel: 6212570, 8379336.

## MALEIC ACID

Olin Chemicals -- See under "Acetic Acid".

## MALT & GRAIN HANDLING EQUIPMENT

Goldin (India) Equipment Pvt. Ltd. -- See under "Grains & Cereals Cleaning/Grading Machinery".

## MALTODEXTRINE

Dewang Corporation -- See under "Aromatic Chemicals"

Olin Chemicals -- See under "Acetic Acid".

The Sukhjit Starch & Chemicals Ltd. -- See under "Starch"

Vertex Chemicals -- See under "Liquid Glucose"

## MATERIAL HANDLING SYSTEMS

Ducon Equipments Private Ltd. -- See under "Consultancy & Design"

MVS Engineering Ltd.-- See under "Air Dryers"

Mac Industrial Systems, C/80, Snehdhara Society, Dadabhai X Road No. 3, Vile Parle (W), Bombay 400 056. Tel: 8215993.

Selvel Conveyors, 17A, & 63C, Balaji Industrial Estate, Hanuman Nagar, Akurli Road, Kandivali (E), Bombay 400 101. Tel : 887 23 03/ 883 86 63/3899, Fax : 91-022-8870605.

Shirke Structurals Pvt. Ltd. -- See under "Silo Storage System"

## METAL CONTAINERS

Divecha Glass Industries, 249 Bal Rajeshwar Rd., Mulund (W), Bombay 400 080.

## METAL DETECTION EQUIPMENT

Mc Nally Bangalore Industrieis Ltd. -- See under "Dehydration Plant/Equipment"

Rathi Industrial Equipment Co. See under "Size Reduction



## STIRWEL STIRRERS

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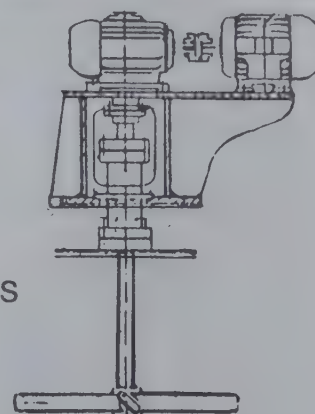
### Applications:

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FACT: OPP. MIRA P.O. MIRA - 401104, DIST: THANE  
TEL.: 811 2581 • FAX: 811 7157



Equipment"

## METAL SEPARATORS

Rathi Industrial Equipment Co. Ltd., 1162/2 Shivajinagar, Behind Observatory, Pune 411 005. Tel : 325 384/325 215. Tlx : 0145-7798 RICO IN. Fax : (0212) 323229.

## METERING PUMPS

Jagdish Engg. Works-- See under "Pumps".

## MICROBE DETECTION DEVICE

Rakiro Biotech, 27 Sahayog, 3rd Fl., 33/35, R.S. Sapre Marg, Kalbadevi, Bombay 400 002. Tel: 91-22-2095837, Fax: 91-22-3631303.

## MILK POWDER PLANT

Goma Engineering Pvt. Ltd.-- See under "Beverage Processing Machinery"

## MILK/MILK PRODUCTS PROCESSING PLANT

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Goma Engineering Pvt. Ltd. -- See under "Beverage Processing Machinery"

## MINERAL WATER BOTTLES

Clair Packaging Pvt. Ltd.-- See under "Bottle Caps & Closures"

## MINERAL WATER FILLING PLANT

Autopack Machines Pvt. Ltd. - See under "Bottle Filling & Sealing Machines"

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Komal Industries -- See under

"Water Treatment Plants/Equipment"

Shriyan Enterprises, 12A Sagar Complex, Bombay - Pune Rd., Kasarwadi Nasik Phata, Pune 411 034. Tel : 779341. Fax : C/o. 0212-779409. \*

Shivsu Watek (P) Ltd., 14 Spur Tank Rd., Chetput, Madras 600 031. Tel : 8266073/8266083/ 8266074. Fax : 91-44-8256606.

Venus Packaging Services-- See under "Crown Cap PCV Lining Machine".

Wonderpack Industries (P) Ltd., -- See under "Biscuit Packing Machinery"

## MINT OIL

Bhagat Impex Pvt. Ltd.-- See under "Essential Oils".

## MIXERS, INDUSTRIAL

Cosywo Engineering Company- See under "Chemical Plant & Equipment".

Fabdecon Engineers-- See under "Agitators".

Fibre & Fibre Products -- See under "Stirrers".

## MIXERS, POWDER & PASTE

Cosywo Engineering Co-- See under "Chemical Plant & Equipment".

Fabdecon Engineers-- See under "Agitators".

Frigmaires Engineers-- See under "Agitators".

Metal Plants -- See under "Contra-Rotary Mixers".

## MOBILE LIFTS (WORK PLATFORM)

Ferro Foundries Pvt. Ltd. Yelwadi Rd., Belvadi, Mysore 571

186, Tel : 42376, 42633. Tlx : 0846-224 HPW IN. Fax: National: 0821-42052.

## MOISTURE REMOVAL UNITS

MVS Engineering Ltd. -- See under "Air Heaters"

## MUSHROOM PROCESSING PLANT

Food Tech Engineers-- See under "Machinery, Food & Beverage Processing".

Sangram Engineering Pvt. Ltd.- See under "Turnkey Plants/Projects".

## NITROGEN GAS PLANT

MVS Engineering Ltd. -- See under "Air Heaters"

## OIL FIRED BOILER

Kalpna Boilers & Chemical Plants Mfg. Co.-- See under "Boilers".

## OIL SEEDS CLEANING / GRADING MACHINERY

Forsberg Agritech (India) Pvt. Ltd.-- See under "Grains & Cereals, Cleaning/Grading Machinery".

Goldin (India) Equipment Pvt. Ltd.-- See under "Grains & Cereals Cleaning/Grading Machinery".

## OLEORESINS

L.B. Aroma Chemicals -- See under "Aromatic Chemicals".

Rakesh Sandal Industries -- See under "Aromatic Chemicals"

Synthite Industrial Chemicals Ltd., Kadayiruppu, Kolencherry 682 311, Kerala. Tel: 04853-60285. Fax: 91-484-370405.

## OLEIC ACID

Soofi Traders -- See under



"Orange Oil".

## ORANGE OIL

Balaji Dye Chem-- See under "Additives, Food & Beverage".

Kushalchand Sons -- See under "Gum Arabic"

Sesu Trading Corp-- See under "Acids".

Soofi Traders, 1317 Dalamal Tower, 211 Nariman Point, Bombay 400 021. Tel: 204 3044/204 5748/2833074. Fax: 2047657

## ORANGE TERPENE (D - LEMONENE)

Sequisa Exports & Imports, 4-B Pankaj Building, Vakola Bridge, Santacruz (E), Bombay 400 055. Tel: 6151919/6133390. Fax: 022-6104232.

## OVENS, BREAD/BISCUIT BAKING

Admir Engineers -- See under "Bakery/Biscuit Equipment".

Aifso Enterprises, A/1, Veena Beena Apts., Sewri (W), Bombay 400 015. Tel: Off: 4137339/4130926. Res: 4137109/4134568. Fax: 91-22-4137339.

Continental Equipment (India) Pvt. Ltd.,-- See under "Bakery/Biscuit Equipment".

Grovers Pvt. Ltd.-- See under "Bakery/Biscuit Equipment".

Prima Engg. Industries -- See under "Bakery/Biscuit Equipment"

Sarlech Enterprises (India) -- See under "Bakery/Biscuit Equipment"

## OVENS, INDUSTRIAL

Flora Engineering Co., A-4/A-42, Laghu Udyog Kendra, I.B. Patel Rd., Goregaon (E), Bombay 400 063. Tel: 8735768. Fax: 91-22-2873059.

## OVENS/TRAY DRYERS

See also "Dryers, Oven/Tray, etc.

Aifso Enterprises -- See under "Ovens, Bread/Biscuit Baking"

Continental Equipment India Pvt. Ltd.-- See under "Bakery/Biscuit Equipment".

Frigmaires Engineers-- See under "Agitators".

Thermal Instruments & Equipments, 2-1-478 Nallakunta University Road, Hyderabad 500 044. Tel: 41720

## OXYGEN ABSORBER

The Panchal Workshop -- See

under "Ice Cream Making Machine"

## PP/HDPE/LDPE SHEETS

Rushabh Plastics, 11/12 Jayesh Ind. Estate, Ramchandra Lane (Extn.) Malad (W), Bombay 400 064. Tel: 8821762/8899768. Fax: 4221633.

## P.P. CAPS

A to Z Bottle Suppliers-- See under "Bottles & Jars, Glass".

Larsen & Toubro Ltd. (Packaging Div.) -- See under "Bottle Caps & Closures"

## P.P. CAPS MACHINERY

Advance Packaging 10/65 Industrial Area, Kirti Nagar, New Delhi 110 015. Tel: 532388, 5410629.

Recon Machine Tools Pvt. Ltd. -- See under "Filling & Sealing Machines"

Wonderpack Industries (P) Ltd.--See under "Biscuit Packing Machinery"

## PACKAGING DESIGNERS

Kalrav Packaging Co., A/62 Tarang Drug Employees Co-Op. Hsg. Soc., Unit No. 3, Gilbert Hill, Andheri West, Bombay 400 058. Tel: 6249330, 6201584, Fax: 91-22-6236196.

## PACKAGING FILM

New Plastomers India Limited, 8 Magan Mahal, 3rd Fl., Above Arasa Hotel, 215 Sir M.V. Road, Andheri (E), Bombay 400 069. Tel: 8391499, 8347977, 8327252. Fax: 91-22-8360748.

Plastic International-- See under "Packaging Material".

Samarpan Converters Ltd. -- See under "Laminated Packaging Film"

## PACKAGING MATERIAL

Bhavani & Sons Pvt. Ltd., See under "Film, Plastic/Metallized"

Compacq Packaging, P-19 Vikas Compound, Vadoli, Chembur, Bombay 400 074. Tel: 5551919. Fax: 5561938.

Divecha Glass Industries (Metal Container Div.) -- See under "Containers, Metal"

Fine Plast Industries Pvt. Ltd., Sarang Street, Taher Bldg, 1st Flr., Bombay 400 003. Tel: 329303/345075. Grams: POLUDRUMS.

Plastic International, B/13, Nanddham Indl. Estate, Marol,

Andheri (E), Bombay 400 059. Tel: 8320798/8322683. Tlx: 11-79498. Gr: Interplast. Fax: (011) 8366237.

Samarpan Fabricators Ltd. -- See under "Filling & Sealing Machine"

Technology Plastics Ltd.-- See under "Containers, Plastic".

W.R. Grace & Co. (India) Pvt. Ltd., 426, 3A Cross, 16th Main, III Block, Koramangala, Bangalore 560 034. Tel: (080) 5534522. Fax: (080) 553 4500.

## PALLET HANDLING SYSTEM

Mac Industrial Systems-- See under "Material Handling System".

## PALLET LIFTERS/STACKERS

Fork Trucks & Services (India) Pvt. Ltd., 31 Lansdowne Place, Calcutta 700 029. Tel: 475-0461, 74-5248. Tlx: 21-5145. Gr: PALLET TRUCKS. Fax: (033) 74-5248.

## PANEL WATER TANKS

Devi Polymers (P). Ltd., TNK House, 48 Anna Salai, Madras 600 002. Tel: 849488/840747. Tlx: 6210 DEVI IN. Fax: 044-840804.

## PAPAINS

Rathi Papains Pvt. Ltd., 105 Dhanlaxmi Indl. Estate, Old Agra Rd., Thane (W) 400 601. Tel: (022) 504011. Tlx: 1182844. Fax: 2872811.

## PARAFFIN WAX

Balaji Dye Chem -- See under "Additives, Food & Beverage".

## PASTEURIZERS

MF Marketing Pvt. Ltd., B-15, Arjun Centre, B.S. Devashi Marg, Govandi, Bombay 400 088. Tel: 5557515/5560947. Tlx: MF IN 76502. Fax: 91-22-5560569.

McNally Bangalore Industries Ltd., -- See under "Dehydration Plant/Equipment"

Machinfabrik -- See under "Cookers, Vacuum, Batch"

## PASTE & LIQUID FILLING MACHINE

Bombay Engineering Industry, R. No. 6 (Extn) Sevantibai Bhavan, Chimatpada, Marol Naka, Andheri (East), Bombay 400 059. Tel: 836 9368, 8215795. Fax: 022 832 7448.

## PECTIN

Aditi Pectins Pvt. Ltd., MIDC Plot No. B/8 Islampur 415409.

Dist. Sangli (M.S.) Tel: (02342) 22343, 22348, 57550. Fax: (02342) 23064.

Amit Fine Chem -- See under "Agar-Agar (Powder/Strips)".

Balaji Dye Chem -- See under "Additives, Food & Beverage".

Concorde Chemical Corp. -- See under "B H A".

IDL Arom International Ltd. -- See under "Gums, Food"

Indian Gum Industries -- See under "Guar Gum"

Indusmen Foods Ltd., H-10 9th Fl., "Everest", Tardeo, Bombay 400 034.

Kiran Kotak & Co. -- See under "Gelatine"

Kushalchand Sons -- See under "Gum Arabic"

Olin Chemicals-- See under "Acetic Acid".

Pecti - Chem Industries. 47 MIDC, Jalgaon 425003. Tel: (0257) 40510, 40535.

Saisha, Saisha House, 386 HAL Second Stage, Bangalore 560 008. Tel: 080-5280255. Fax: 080-5282384

Sesu Trading Corporation-- See under "Acids".

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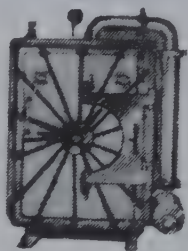


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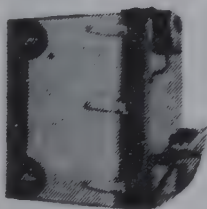
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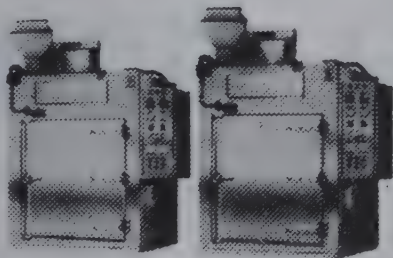
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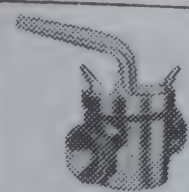


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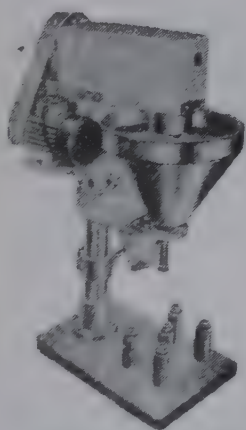
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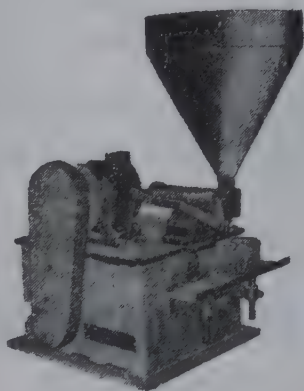
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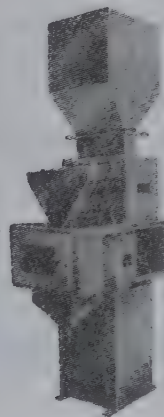
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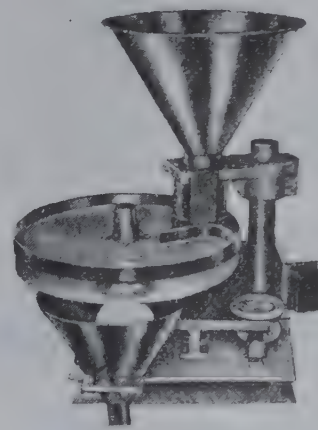
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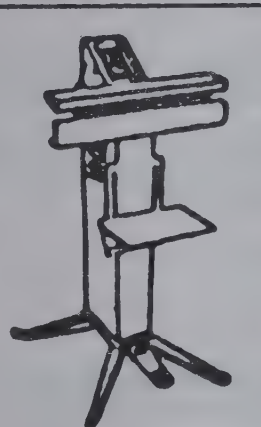
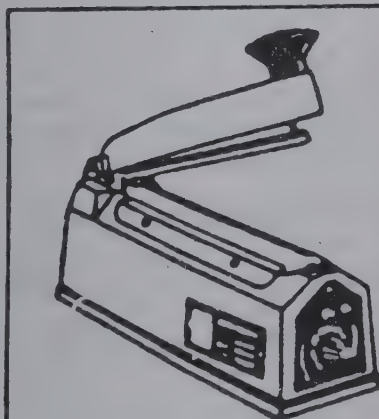
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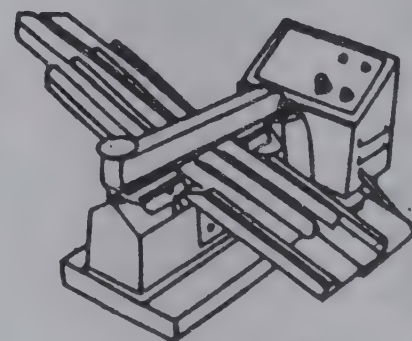
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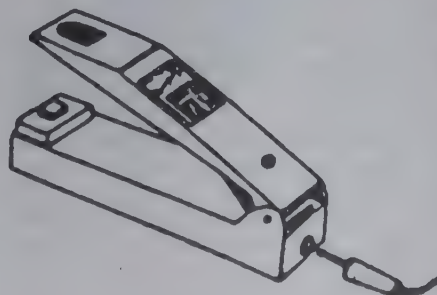


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- \* LOVIBOND Tintometer: Imported
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- \* Gas Chromatograph Apparatus

#### ACCURATE IN QUALITY

- \* Refrigerated Centrifuge
- \* PH Meter/Conductivity Meter
- \* B.O.D. Incubator
- \* Polarimeter/Refractometer
- \* Hand Refractometer 'ERMA'
- \* Microscopes: Research Model
- \* Autoclave/Sterilizer
- \* Photo Elect. Colorimeter

#### BEST QUALITY

- \* Stirrers & Emulsifiers
- \* Hot Air Oven/Drying Oven
- \* Muffle Furnace
- \* Heating Mantles
- \* Water Bath-Water Still
- \* Vacuum Pumps: 'JB Vac'
- \* Test Sieves/Sieve Shaker
- \* Bomb Calorimeter

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KINDLY CONTACT:

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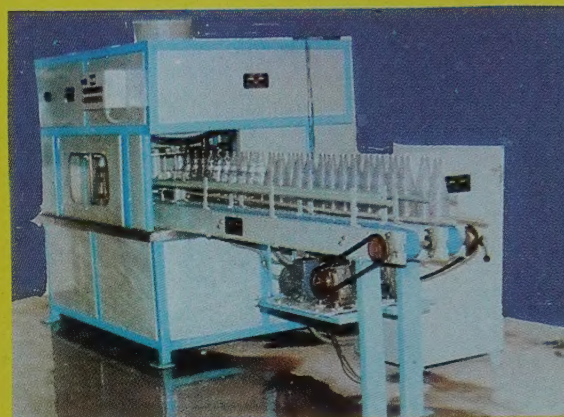
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